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# STEEL

FOR FORTY-EIGHT YEARS—IRON TRADE REVIEW


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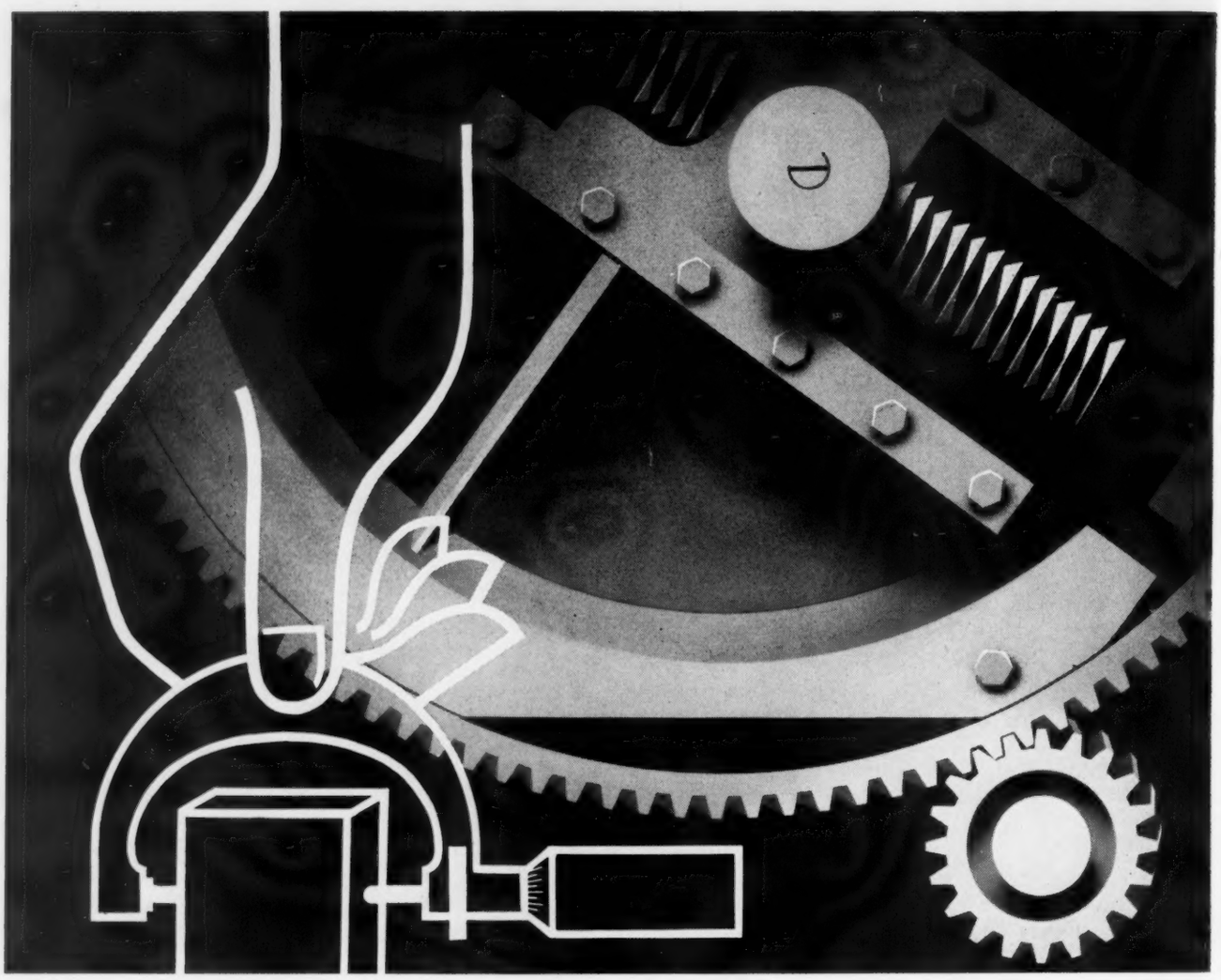

# PRECISION

IT TAKES a precise machine to turn out precise work. And if its vital parts are made of Moly irons or steels, the longer maintenance of its precision is assured. Shapers, for instance.

One company building such machines uses 0.50% Mo, Nickel-Moly iron for main and intermediary gears in the power transmission system. This iron is used because ***it possesses the wear resistance which preserves the close tolerances necessary to prevent "chattering."*** Also—because it machines readily despite its comparatively high hardness.

Thus, the use of Moly brings advantages: (a) to the builder of the machines through simpler and more economical fabrication; (b) to the user through better performance due to longer maintained precision; (c) to the user's customers through better products.

Our technical book, ***"Molybdenum in Cast Iron,"*** contains money-saving data. Free to engineers and production executives. Drop us a card and we will send it to you. Climax Molybdenum Company, 500 Fifth Avenue, New York City.

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# As the Editor Views the News

EMILDLY encouraging were last week's market developments. The drop of 1 point in steel ingot production reported a week ago proved but a temporary manifestation. Last week's rate (p. 49) was 48½ per cent, another new high for the year. STEEL's index of industrial activity (p. 65) now stands at 75.7 per cent, also a new high for the year. A hopeful outlook for 1938 seems warranted by a study of STEEL's chart (p. 48) which shows how slow output has been this year. With inventories low and with the volume of business gradually expanding, normal expectancy is for improvement next year. . . . This year marks the fiftieth anniversary (p. 47) of the commercial production of basic open-hearth steel in this country.

• • •

Rare event these days is the blowing in of a large, modern, new blast furnace; such a unit last week (p. 50) was coming into production at Youngstown, O. . . . Important recommendations applying to pipe and tubing materials, ferroalloys and electrolytic copper have been approved (p. 54) by the American Society for Testing Materials. . . . A new all-steel house, completely equipped, containing living room, dinette, kitchenette, bathroom and two bedrooms, is available at $2500 erected. It contains about four tons of steel, mainly flat rolled. Initial installation (p. 50) has been completed near Cleveland. . . . STEEL's survey of the lumber industry in the Northwest (p. 59) indicates a broadening in demand from this source for steel and equipment even though the industry labors under handicaps.

**New Blast Furnace**

• • •

Regional offices are being established in 12 key cities (p. 57) by the wages and hours administration and the administration's attorneys are working day and night to promulgate rules that can be applied to industry generally when the wages and hours act becomes effective. No standards yet have been set up for individual industries. Certain portions of the act, it is held, required clarification. Opinion is growing that a 40-hour maximum work week is not economically desirable. . . . Slowness continues to mark the approach of the national economic committee on its studies (p. 57) and indications are that its hearings will not be started until after the election in November. The committee now talks of employing economic experts of the Brookings institution.

**Make Wage, Hour Rules**

• • •

A recent survey shows (p. 68) that losses are suffered at many plants because old electric wiring systems are not adequately insulated or are too small to carry present-day loads. Where such conditions prevail replacements are warranted. . . .A new course in welding engineering (p. 70) is not for beginners; of an advanced character, it is for men in industry. . . . Testing of automotive parts continues to be more exhaustive in scope. One company has supplemented its proving ground (p. 72) with a laboratory. . . . Airplanes entirely built of spotwelded stainless steel are not beyond the bounds of future possibilities, says one authority, but there are certain factors (p. 74) why aluminum alloys now are favored. Highly flexible equipment is used in spotwelding such materials.

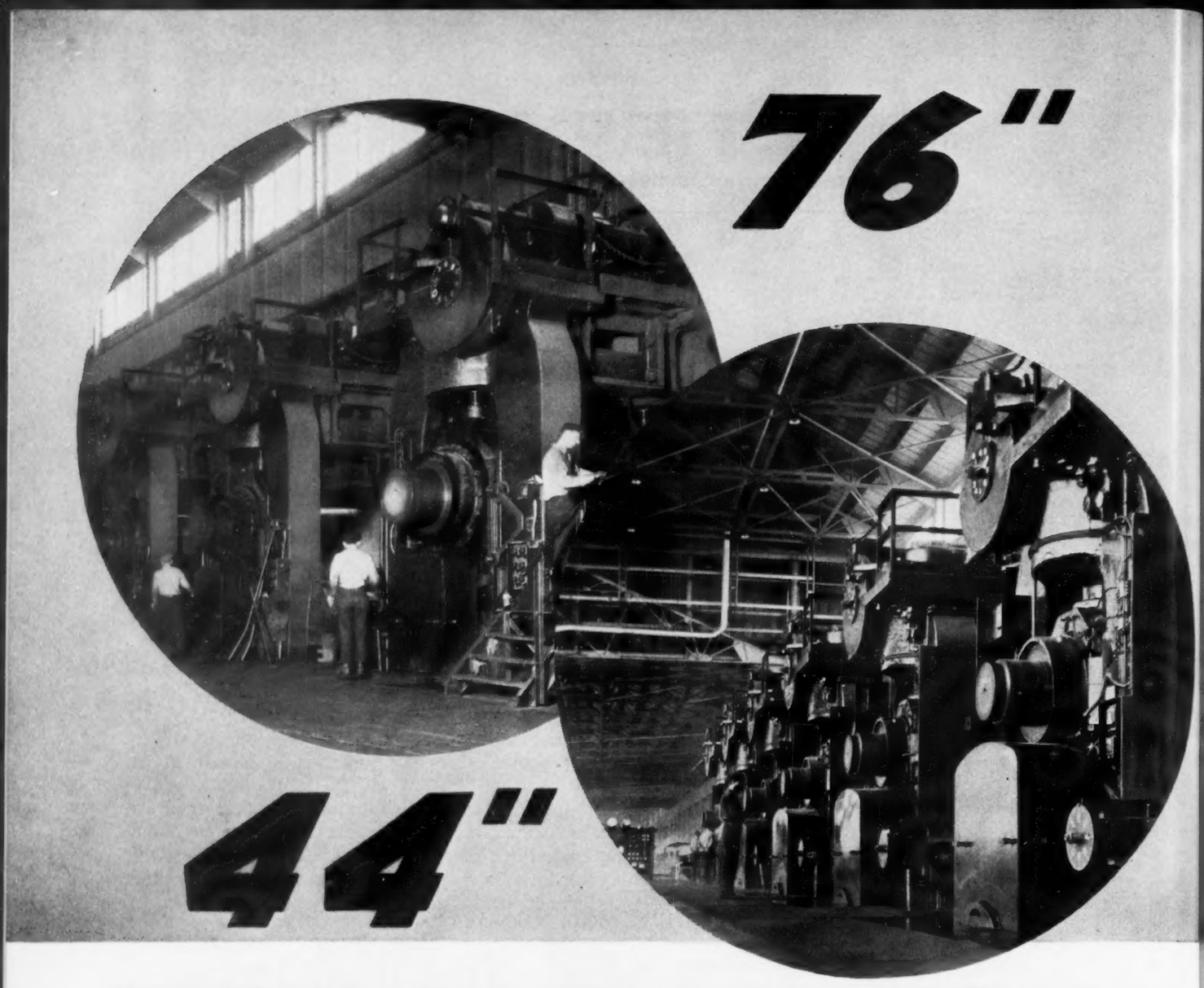
**All-Steel Airplanes**

• • •

Many different finishes are applied to cash registers. One company (p. 78) has developed an elaborate mechanical system which insures quality and lowers cost of finishing. . . . Two years' experience with variable voltage control in a large steel mill shows (p. 80) this system speeds production and halves the former maintenance and repair cost. . . . Following a long development period, submerged gas burners (p. 84) have been placed on the market. Their use is said to produce notable economies in heating pickling baths and to provide more agitation. . . . A new microscope instrument (p. 89) permits assurance of absolute accuracy of alignment of long grinding machine beds. . . . Quality of galvanized coatings is improved (p. 90) when the pickling operation is performed in minimum time.

**Speed Aids Galvanizing**

E. L. Shaner




# Two Modern Strip Mills are Teamed Together for Better Service to Inland Customers

In 1932 Inland installed one of the country's first wide continuous strip mills. This 76″ unit now has a new running mate . . . . one of the country's highest speed mills, capable of rolling a mile of steel a yard wide in 2½ minutes.

This new 44″ mill increases Inland's flat rolled steel capacity 45,000 tons per month, greatly expanding our facilities for prompt service to customers. Its higher speed and numerous improved mechanical features also permit more effective control over quality and uniformity of output.

Temperature control, for example, is made automatic as the hot strip enters the finishing stands, by an electric pyrometer which "looks" at the steel, records its temperature and sounds a warning if there is any variation.

Important also to steel buyers is the fact that this new mill is matched with equally modern steel making and finishing equipment . . . all of it new within the past few years, from blast furnace and open hearths to cold finishing mills, annealing furnaces, tin mills and galvanizing department.

We are confident that these new facilities now enable us to produce, not only more, but better sheets and strip. Your nearest Inland office will make this improved service promptly available to you.

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SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES STRUCTURALS PILING RAILS TRACK ACCESSORIES REINFORCING BARS

■ STEEL'S metallurgist, on the occasion of this fiftieth anniversary, calculates that if all the steel made in the United States in the past 50 years were to be rolled out in a plate 1 inch thick, 1 mile wide, it would reach from New York to San Francisco. But, great as the tonnage—one billion and a quarter—spread out over the country's surface area, that steel would be only a film 0.000083-inch thick, too thin to be rolled

# Fiftieth Anniversary of Commercial Basic Open-Hearth Steel in United States

■ THIS year marks the fiftieth anniversary of the manufacture of basic open-hearth steel on a commercial basis in the United States.

Since 1888 this country has produced 1,277,000,000 gross tons of steel, of all kinds. Products have been diversified, thousands of new applications developed. Annual output has increased from 2,899,440 tons to 50,568,701 tons in 1937, with an all-time high in 1929, 56,433,473 tons.

Consider 1,277,000,000 tons of steel:

Rolled into a plate 1 mile wide and 1 inch thick, it would reach from New York to San Francisco.

Or, it would make a solid mass 1 mile square and approximately 210 feet high, containing 5,840,000,000 cubic feet.

Consider it again—spread out to "roof" the United States, 3,026,789 square miles. It then would be merely a film, 0.000083-inch thick.

Although basic steel was made in England as early as 1879, it was not commercially produced in this country until 1888, when it was manufactured at the Homestead works, Carnegie, Phipps & Co. Ltd.

Acid open-hearth furnaces were introduced in the United States as early as 1868 by the New Jersey Steel & Iron Co., Trenton, N. J. After a year or two of intermittent operation, the Trenton furnace was abandoned. The second acid open hearth was built by the Bay State Iron Works, South Boston, Mass., in 1870, and was successfully operated.

Otis Steel Co., Cleveland, produced the first basic open-hearth steel in 1886, but later reverted to the acid process because it was faster.

Output in 1888 included only 314,318 tons of open-hearth steel, acid and basic; 2,511,161 tons bessemer; 70,279 tons crucible; and 3682 tons electric and other.

### Passed Bessemer in 1908

It was not until 1908—20 years after its commercial development in this country—that open-hearth steel production passed bessemer. In that year was made 7,836,729 tons of open-hearth steel, 6,116,755 tons of bessemer. Since 1908, of course, open-hearth production has gained tremendously. In 1937, output was 46,272,303 gross tons, against 3,449,927 tons of bessemer.

Fifty years ago, approximately half, sometimes more, of total steel output was rolled into rails. In 1888, characterized by the *Iron Trade Review* (now STEEL) as "a bad year for steel rails," 1,528,057 net tons of bessemer rails were produced. In the preceding year, rail business had been better, and output was 2,290,197 tons.

Other railroad needs, shipbuilding, heavy construction, machinery and farm implements took most of remaining output.

In contrast, 1937 distribution: Automobiles, 20.04 per cent; buildings, 12.32 per cent; railroads, 11.74 per cent; containers, 8.71 per cent; exports, 6.74 per cent; oil, gas and water, 5.84 per cent; machinery, 4.88 per cent; agriculture, 3.66 per cent; jobbers, 13.28 per cent; and miscellaneous, 12.79 per cent.

Today's leading consumer, automobiles, was unknown 50 years ago; now there are more than 29,000,000 motor vehicles. Steel for consumers' goods was negligible. Steel containers were not common.

New and wider fields will be opened by progress now being made, as indicated in the preview of the National Metal Congress, beginning on page 121, this issue. Here leaders in the metal industry paint a vivid panorama of the year's progress, indicate trends of the future.

# Stocks Low, Consumption Tending Upward; Fourth Quarter Appears Year's Best

■ WITH the steel industry entering the fourth quarter at the highest ingot production rate since last fall, the possibility is bright that output for the entire year will be 35 to 40 per cent better than was indicated three months ago.

Last June, on the basis of operations during the first half, it appeared possible that 1938 production would fall short of 20,000,000 tons. This would rank it second only to 1932 among the poorest years of modern times. Output in 1932 was 13,322,833 tons. The unusually sharp recovery since early July, however, has salvaged considerable from the wreckage created by the inauspicious first half.

Barring an unforeseen collapse in the general business structure, the ensuing three months seem likely to constitute the most active quarter of the year and may push 1938 ingot production well above 26,000,000 tons. Should output top that figure, 1938 would better the record of each of the years 1931 through 1934 but would be far below the tonnages for 1936, 1937 or any of the several years immediately preceding the depression.

In contrast to the consistent and abrupt drop in steelmaking during the fourth quarter of last year, a relatively steady rate currently is in prospect. Production the first half of 1938 was 62 per cent below 1937. For the first nine months, estimated output of nearly 18,000,000 tons was 57 per cent short of the 42,482,597 tons for the corresponding period last year. For all of 1938, a decrease of 45 to 50 per cent is indicated, although fourth quarter alone should better the corresponding 1937 figure of 7,020,310 tons.

Principal factor responsible for the extremely sharp contraction in steelmaking a year ago was the surplus of consumers' inventories. Consumption among leading steel users was declining gradually, but buying was reduced drastically to permit absorption of excess stocks. The opposite situation is true today. Inventories are low and buying is for only a short distance ahead, but consumption is tending upward.

Variations in activities of principal steel consumers so far this year have been marked. Automobile production the first nine months practically paralleled the shrinkage in steelmaking compared with 1937, with a decrease of 58 per cent.

On the other hand, awards of fabricated structural shapes, as compiled by STEEL, showed a drop of only 20 per cent, while concrete reinforcing bar contracts for the nine months were about the same as a year ago.

### Ore Shipments Down

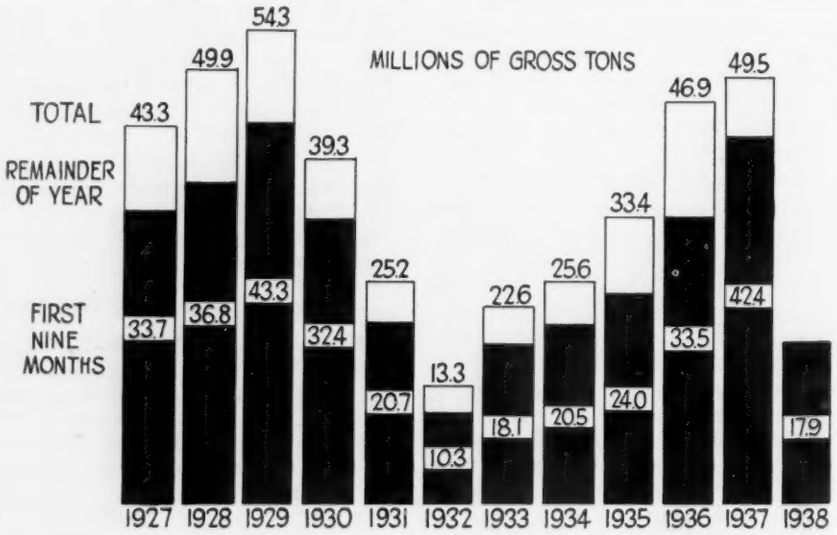
Railroads made a poor comparison in their steel purchases the first three quarters. Freight car orders were off about 80 per cent from last year, while rail production declined at least 50 per cent.

Reflecting heavy ore supplies and the sharp contraction in blast furnace operations in the year to date, shipments of Lake Superior iron ore from upper lake ports in the season to Oct. 1 totaled only 14,157,290 gross tons, a decrease of 74.08 per cent from the 54,612,122 tons moved the corresponding period last year. September shipments of 3,284,800 tons were off 5,889,191 tons, or 64.19 per cent, from the 1937 figure.

The steel industry is placing considerable hope on requirements of automobile builders to keep the trend of steelmaking upward, or at least steady, during the new quarter. A popular estimate of probable output of motor cars the remainder of the year is slightly above 800,000 units, making it the best quarter of the year. This compares with 1,061,957 units the last quarter of 1937 and 1,154,806 in the 1936 period.

On the surface it would appear that automotive steel demand the next three months will be nearly 20 per cent less than a year ago and will forestall the possibility of catching up with the 1937 steelmaking

## Nine Months in Steel Production




■ **In eight of the past 11 years more than 75 per cent of the year's total output was made in the first nine months; in the other three years, over 70 per cent. The proportion in 1927 was 78 per cent; 1928, 73.7; 1929, 79.7; 1930, 82.4; 1931, 82.1; 1932, 78.1; 1933, 80; 1934, 80; 1935, 71.2; 1936, 71.4; and 1937, 80.5. With September estimated, output in the first nine months this year is 17,971,861**

rate. As automotive assemblies increase, however, the more favorable position of raw material inventories at this time will stimulate steel shipments much more rapidly than was true in late 1937. Nevertheless, it is obvious that needs of motorcar builders alone will be insufficient to push up operations.

Similarity of the recovery in steel production the past three months and in the corresponding period of 1935 has been marked. Both years had a poor first half, with operations varying according to the common seasonal pattern but at depressed levels. The start of a sustained upturn in production occurred early in July of both years, and the climb continued well into September before leveling off. STEEL's reviews of three years ago spoke of war scares, as Italy prepared to invade Ethiopia. Mention also was made of poor demand from the railroads and the expectation that the automotive industry would lead the way to heavier steel demand.

### 1938 Recovery More Rapid

The principal difference between the trend in steel production for the two years is that while operations were on a higher plane in 1935, the recovery this year has been more rapid. Ingot output the first quarter of 1938 was 64 per cent of that of the corresponding 1935 period. The ratio in the second quarter was 71.5 per cent, or an improvement of 7.5 points or nearly 12 per cent in the comparison. Another 12 per cent gain occurred in the third quarter, raising 1938 production to about 80 per cent of the 1935 figure.

Except for the uniformity of the relationship and similarity of conditions the past six months, there is no definite basis for assuming that this 12 per cent increase each quarter in the ratio between the two years will continue during the present period. In the event it should, however, fourth quarter output would be about 90 per cent of the 9,381,500 tons produced the last three months of 1935, or slightly less than 8,500,000 tons. This would mean average operations for the quarter of 48 per cent and for the entire year a production of nearly 26,500,000 tons.

Failure of the trend in steelmaking lately to match its swift July-August ascendency has been disappointing to some who lost sight of the fact that much of the third quarter expansion merely enabled mills to catch up with consumption and to bolster depleted supplies of semifinished steel. Earlier in the year, production had lagged behind consumption as inventories were absorbed. With the reaching of a closer balance between supply and demand, production leveled off to await gains in consumption.

## District Steel Rates

Percentage of Ingot Capacity Engaged in Leading Districts

| | Week ended Oct. 8 | Change | Same week 1937 | Same week 1936 |
|---|---|---|---|---|
| Pittsburgh | 37 | None | 62 | 77 |
| Chicago | 44.5 | + 3 | 65 | 75 |
| Eastern Pa. | 33 | + 1 | 55.5 | 49 |
| Youngstown | 55 | + 6 | 60 | 80 |
| Wheeling | 54 | None | 74 | 92 |
| Cleveland | 51 | + 2.5 | 63 | 82 |
| Buffalo | 51 | None | 70 | 84 |
| Birmingham | 57 | None | 77 | 64 |
| New England | 65 | None | 65 | 70 |
| Cincinnati | 43 | None | 70 | 90 |
| St. Louis | 45.5 | − 3 | 60 | † |
| Detroit | 72 | None | 92 | 95 |
| Average | 48.5 | + 1.5 | 66 | 75 |

†Not reported.

# PRODUCTION

■ STEELWORKS operations last week advanced in four centers, held stationary in seven and receded in one. The national rate rose 1.5 points to 48.5 per cent.

**Youngstown, O.** — Increased 6 points to 55 per cent, with resumption of bessemer capacity by Youngstown Sheet & Tube Co., and addition of an open hearth by Republic Steel Corp. and two by Carnegie-Illinois Steel Corp. Republic lighted a blast furnace Wednesday. Some recession is expected for this week as Republic may suspend open-hearth production here.

**Central eastern seaboard**—Up 1 point to 33 per cent on slight expansion by two producers.

**Cincinnati**—Unchanged from 43 per cent, but resumption by two open hearths is expected to increase rate this week.

**Buffalo**—With 22 open hearths in production the rate held at 51 per cent.

**New England** — Steady at 65 per cent, the highest level of the year.

**Birmingham, Ala.** — Unchanged at 57 per cent, with 13 open hearths in production.

**St. Louis** — One open hearth was taken off last week, reducing the rate 3 points to 45.5 per cent.

**Pittsburgh** — For the second week production held at 37 per cent, with indications for a higher rate this week.

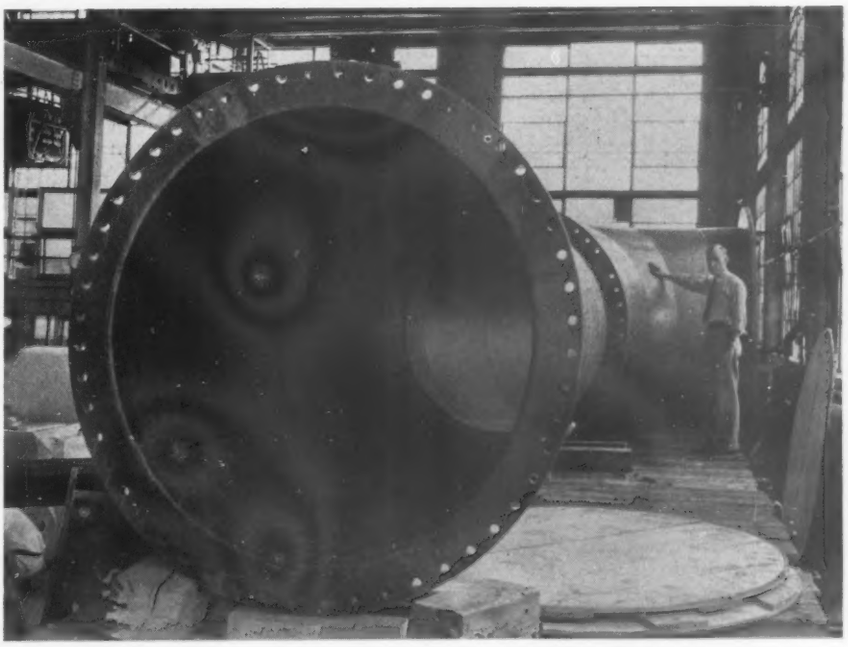
**Wheeling** — Continued at 54 per cent for the third week.

**Detroit** — With 15 furnaces in operation the full week the rate held at 72 per cent.

**Cleveland** — Addition of an open hearth last week increased the rate 2.5 points to 51 per cent, a new high for the year.

**Chicago** — Up 3 points to 44.5 per cent, the highest level since third week of October.

## Steel Pipe, Rubber-Lined, To Extract Ocean Chemicals



■ To protect against corrosion, hard rubber lining 3/16-inch thick was installed in more than 100 feet of 42 to 72-inch diameter pipe by the B. F. Goodrich Co., Akron, O. The pipe will be part of an Atlantic seaboard plant for producing chemicals from ocean water and will be used to handle chlorinated and acidified water at 30 degrees Cent.

# New Youngstown Blast Furnace Blown in By Republic Steel

■ REPUBLIC STEEL CORP.'S new 1000-ton No. 3 furnace at Youngstown, O., was blown in last week, following ceremonies in which Mayor Lionel Evans lighted the furnace in the presence of 150 guests.

The furnace, which replaces a 500-ton furnace at the corporation's Youngstown plant, was hailed by Mayor Evans, himself a former steelworker in the valley mills, as proof of the Mahoning valley's continued and growing importance in the nation's steel industry.

Roy L. Leventry, Republic's Youngstown district manager, was host to the group at luncheon in the plant and for a tour of inspection through the enlarged coke works which are to be placed in operation later this month. Guests included civic officials, J. C. Barrett, dean of blast furnace men in the United States and associated with the Ohio Works, Carnegie-Illinois Steel Corp.; William B. Pollock, president, Wm. B. Pollock Co., Youngstown, which built the furnace.

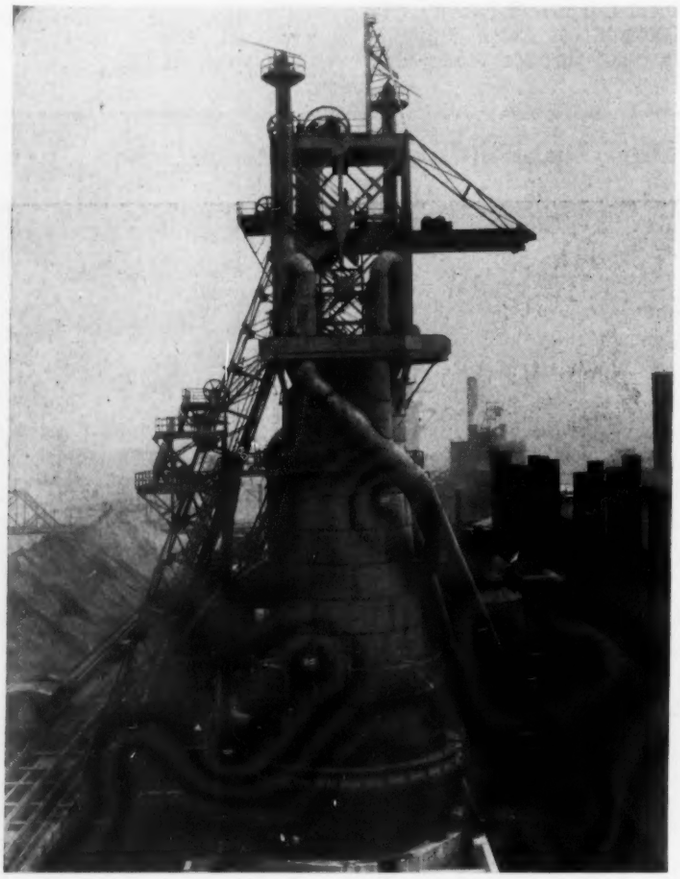
The furnace embraces all the recent developments in furnace design and will prove of particular importance to the Mahoning valley, because it insures increased production for use in Republic's plant, which in the past has been handicapped by limited pig iron capacity.

### Foundation on Piling

Foundations for the furnace were built on pipe piling driven to rock after borings revealed a layer of quicksand at about a 35-foot depth over a considerable part of the site. Altogether, there were 180 piles, 16-inch outside diameter, ⅜-inch electric welded open-end tubes, a total of more than 11,600 feet of piling.

Piling is capped by a 3000-ton reinforced concrete pad, 65 feet wide, 75 feet long, and 6 feet thick.

Blast furnaces built within the past two years include: A new 1000-ton stack for Great Lakes Steel Corp. at Ecorse, Mich.; a new 1000-ton stack for Inland Steel Co. at Indiana Harbor, Ind.; Republic's 1000-ton No. 4 stack at Cleveland (replacement); American Rolling Mill Co., a 450-ton furnace at Hamilton, O., (replacement).



■ Lighting Republic Steel Corp.'s new 1000-ton blast furnace at Youngstown, O., last week was made a civic celebration, with Mayor Lionel Evans applying the torch

## Four Tons of Steel Used In New $2500 House

■ Initial installation of a new all-steel house to sell at $2500 fully equipped has been completed near Cleveland by the Week-End House Corp., New York, of which B. J. McGarry is president. This is the first of a series of similar houses now in production.

The new house is entirely of sheet steel construction. It consists of living room, two bedrooms, bath and completely equipped kitchenette. Heat is furnished by a newly developed hot-air system constructed and designed as a fireplace, and heated by gas, oil, coal or wood. Exteriors are finished in baked enamel, any color. Interior finish may be of any type, such as plaster, plywood and others.

### House Is Prefabricated

Approximately four tons of steel, mainly flat rolled, is used in construction. The house is entirely prefabricated and is assembled on the site. It is available in four architectural designs, including such features as extra bedroom and bath and combination dining room and kitchen. Walls and roof are fully insulated. Any type floor can be selected.

The new house originally was designed to meet demand for cottages on the sea coast, Florida and the Great Lakes area but the present plan is to market it throughout the United States due to its general applicability. It has been approved by the federal housing administration so that purchase may be arranged through local banks or any other lending institutions.

## Carriers, Steel Mills Continue Rail Research

■ Announcement has been made by the Association of American Railroads that co-operative research on steel rails, which has been under way for seven years, will be continued for two years.

The steel rail research, carried on jointly by railroads and steel manufacturers, is conducted at the University of Illinois and in the field. Progress has been made toward manufacture of tougher and stronger steel rail as a result of these experiments, it was reported.

# LABOR

### NEW YORK SCRAP WORKERS WIN WAGE RATE INCREASE

■ A BOARD of arbitration has fixed minimum wages for employes in New York iron and steel scrap yards at 47½ cents per hour for general yard men, 50 cents for incidental burners and 67½ cents for chauffeurs.

Under two-year contract signed by the dealers with the union June 21, 1937, minimum rate for yard men was 45 cents per hour and for chauffeurs 65 cents. Wage and hour provision of the contract was subject to revision last June and the union demanded seven separate classifications and increases of about 20 cents per hour.

When employers rejected these demands as being excessive, the matter automatically went to arbitration. Award is retroactive to June 21.

In addition to increases of 2½ to 5 cents per hour, the award establishes a 45-hour week, time and one-half for overtime, pay for Christmas and New Year holidays for employes of more than one year's standing.

### REPUBLIC EMPLOYES TELL OF PICKETS' VIOLENCE

Twelve Republic Steel Corp. employes in affidavits filed with the senate civil liberties committee last week described violent attacks by pickets during the strike at the corporation's Canton plant in 1937.

Affidavits were taken by the committee under an agreement with T. F. Patton, Republic general counsel, who had protested the "one-sided picture" obtained by the committee when it heard union representatives and strikers in the hearing several weeks ago. The 12 affidavits placed in the record were part of 500 submitted by the steel company attorneys, committee spokesmen said.

Charges by the Republic employes included stonings, beatings and threats by pickets.

### UNEMPLOYMENT CLAIMS DECLINE IN AUGUST

Unemployment benefit payments totaling $47,000,000 and a decline of more than 30 per cent in the number of initial claims for benefits filed during August have been announced by the social security board. Continuance, in all but a few states, of improved employment conditions noted in connection with unemployment compensation operations during July, was indicated by the sharp drop in the number of initial claims.

Benefits paid in August increased by some $9,000,000 over the previous month, but approximately $8,000,000 of this was paid by Iowa, Michigan, and South Carolina, in which August was the first full month of benefit payments. Special reports to the social security board indicate the remaining increase was due largely to administrative factors. In many instances, it represented a backlog of claims finally cleared during the month, rather than current payments.

### TATA WORKERS HAVE SHARE IN COMPANY EARNINGS

Announcement by Tata Iron & Steel Co. Ltd., Jamshedpur, India, of a bonus of three months' pay to all employes, including officials, for the fiscal year 1937-38, is based on the profit-sharing plan introduced last year. The bonus for 1936-37 was one and a half month's wages. Previous to that it had been a month's wages as a goodwill gift. The new plan admits workers to partnership in company earnings.

When dividends exceed approximately $3,500,000, employes receive half a month's pay for each additional $900,000 in dividends. Labor rates compare favorably with others in India and the profit-sharing plan is unique in that country.

## Steel Must Be Placed

■ **Construction views on the Grand Coulee dam, Washington. Workers ride a 13-ton outlet conduit from canyon wall on the Columbia river to its place in the dam 600 feet below**

■ **Above—His safety belt locked to the reinforcing bars, the worker's hands are free for the wiring job under way. Employed at the dam now are 5729 men**

## Harvester Company Will Recall 6500

■ Increased sales and lowered inventories last week caused International Harvester Co., Chicago, to schedule heavier production at its Chicago, Rock Island, Ill., and Milwaukee tractor plants. Approximately 6500 men will return to work within next several weeks.

Sales officials estimate the increased schedules will last until late spring. The West Pullman tractor plant in Chicago, where auxiliary tractor parts are manufactured, is also increasing employment.

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■ American shipyards Sept. 1 were building or had under contract for private owners 158 vessels aggregating 465,297 gross tons. Aug. 1 they had the same number of vessels under contract or building, with tonnage of 440,481, according to the department of commerce.

# MEN OF INDUSTRY

■ SOCIETY of Automotive Engineers announces the nomination of W. J. Davidson, general sales manager, diesel engine division, General Motors Sales Corp., for president of the society for 1939, and David Beecroft, Bendix Products division, Bendix Aviation Corp., as treasurer.

Nominees for one-year terms as councilors are: W. E. McGraw, chief engineer, Chrysler Corp. of Canada Ltd.; G. L. Neely, research engineer in charge of fuels and lubricants, Standard Oil Co. of California, and A. L. Beall, research engineer, Wright Aeronautical Corp.

Members of the 1939 council will also include the following who were elected at the beginning of 1938 for a two-year term: Mr. Davidson, L. J. Grunder, automotive engineer, Richfield Oil Corp.; B. J. Lemon, new products department, United States Rubber Products Inc.; also serving on the 1939 council as past presidents are Harry T. Woolson, executive engineer, Chrysler Corp., and C. W. Spicer, vice president, Spicer Mfg. Corp.

Nominated for division vice presidents are the following: *Aircraft*, William Littlewood, vice president, engineering, American Airlines Inc.; *aircraft engine*, H. K. Cummings, chief, automotive power plants section, National Bureau of Standards; *diesel engine*, F. G. Shoemaker, chief engineer, Detroit Diesel Engine division, General Motors Corp.; *fuels and lubricants*, A. G. Marshall, manager, technical applications, Shell Oil Co.; *passenger car*, John G. Wood, assistant chief engineer, Chevrolet Motor division, General Motors Corp.; *passenger car body*, I. L. Carron, body engineer, Dodge Bros. division of Chrysler Corp.; *production*, W. B. Hurley, staff engineer, sales department, Detroit Edison Co.; *tractor and industrial power equipment*, J. S. Erskine, engineer, allied industrial equipment, International Harvester Co.; *transportation and maintenance*, Harry O. Mathews, automotive engineer, Public Utility Engineering & Service Corp.; *truck, bus and railcar*, Carl J. Bock, truck division engineer, General Motors Truck & Coach division, Yellow Truck & Coach Mfg. Co.

♦

Richard E. Pritchard and Joseph Stone, vice presidents, Stanley Mfg. Co., New Britain, Conn., sailed for Europe Oct. 5.

♦

L. L. White, for the past two years president, Pittston Coal Co., New York, subsidiary of the Erie railroad, has recently been appointed vice president in charge of purchases for the Erie railroad, with headquarters in the Midland building, Cleveland.

W. J. Davidson

♦

Douglas M. Clarke, formerly manager of the New York sales office of AC Spark Plug division, General Motors Corp., has been appointed to the general sales staff of the company in Flint, Mich.

♦

Theodore William Marz has assumed his new duties as director of purchases, Andrews Steel Co. and Newport Rolling Mill Co.; also the subsidiaries, Newport Culvert Co. and Globe Iron Roofing & Corrugating Co. He succeeds the late Rud K. Boggs. Mr. Marz has been with the organizations 20 years, recently as assistant purchasing agent. He has served as vice president, National Association of Purchasing Agents.

♦

V. A. Dodds, manager of sales, Brown-Wales Co., Boston, since November, 1935, has been elected vice president in charge of sales. A native of Boston, Mr. Wales has been associated with the sales department of the company since 1919. John G. Fowler has been named vice president in charge of the Lewiston, Me., branch of the company.

V. A. Dodds

♦

Martha Buerkle has been elected secretary, American Refractories institute, Pittsburgh, succeeding Dorothy A. Texter, who has resigned after long association with the institute.

♦

F. C. Russell, heretofore manager of roofing sales, H. H. Robertson Co., Pittsburgh, manufacturer of prefabricated building products, has been named general manager of sales. Pierre Blommers, formerly manager of ventilation and daylighting sales, has become assistant general manager of sales.

♦

J. C. Argetsinger, vice president and general counsel, Youngstown Sheet & Tube Co., Youngstown, O., is one of 15 speakers scheduled to appear in a special course conducted for business executives during the fall and winter months by Westminster college, New Wilmington, Pa. Mr. Argetsinger will discuss the relations between capital and labor and the part government should play in a fair program.

♦

W. Stuart Symington has been elected president and general manager, Emerson Electric Mfg. Co., St. Louis. He succeeds Joseph Newman, who will continue as chairman of the board. Oscar C. Schmitt continues as vice president in charge of fan and motor sales; Raymond E. Otto has been made manager of motor sales, replacing L. F. Blough, resigned; John Wright is manager of fan sales, and E. L. Splitstone has become chief engineer, replacing J. A. Rodgers, resigned.

## DIED:

■ FRANK D. FULLER, 53, president and general manager, Moore Drop Forging Co., Springfield, Mass., Sept. 25. He had been with the Moore company 30 years.

♦

John P. Nicholas, 71, formerly with the Jackson Iron Co., and the Lackawanna Steel Co., at his home in New York recently.

♦

Arthur W. Savage, 83, inventor and founder, Savage Arms Co., Utica, N. Y., Sept. 22 in San Diego, Calif.

♦

Arthur H. Adams, 59, consulting engineer of New York, in that city, Sept. 25. He was an engineer for the Western Electric Co. Inc., from 1901 to 1918, and from 1918 to 1921

was employed by the North Electric Mfg. Co., Galion, O., after which he became a consulting engineer. He was a member, American Society of Mechanical Engineers.

♦

Curtis A. Freeland, 70, president, Freeland Sons Co., Sturgis, Mich., metal tank manufacturer, at his home there, Sept. 30.

♦

Edwin C. McSheehy, 56, representative in the Denver district for Republic Steel Corp., Cleveland, Sept. 28.

♦

George M. Sibley, 77, former president, Denver Iron Works & Foundry Co., Denver, in that city, Sept. 20.

♦

Edward L. Buell, 68, in Cleveland, Sept. 16. He formerly was traffic manager for the Brown Hoisting Machinery Co. and later for the Wellman-Seaver-Morgan Co., Cleveland, retiring eight years ago.

♦

Carl C. Harris, 80, former steel broker, Oct. 2 in Cleveland. Prior to forming his own steel brokerage office he was associated with the Otis Steel Co. and the Illinois Steel Co. He retired about 20 years ago.

♦

Richard Crane, 56, former vice president, Crane Co., Chicago, and at one time United States Minister to Czechoslovakia, recently. He also had been associated with the Eaton, Cole & Burnham Co., Bridgeport, Conn., and was president of its successor, the Crane Valve Co., from 1910 to 1914.

♦

Joseph V. Little, 70, technical adviser, Firth-Sterling Steel Co., McKeesport, Pa., in Philadelphia, Sept. 27. Until the firm's dissolution a year ago, Mr. Little for more than 40 years had been a member of MacFarland & Little, steel specialists, Philadelphia.

# Activities of Steel Users, Makers

■ THOMSON-GIBB Electric Welding Co., Lynn, Mass., has announced that William H. Gibb has established offices at 101 North Thirty-third street, Philadelphia, from which he will serve the Philadelphia territory, which includes eastern Pennsylvania, southern New Jersey, Delaware, Maryland and Virginia. Mr. Gibb has many years experience in the field of resistance welding, having founded and served as president of the Gibb Welding Machines Co., Bay City, Mich., until it was merged with the Thomson Co. in 1929 to form the Thomson-Gibb Electric Welding Co.

♦

Tool Steel Gear & Pinion Co., Cincinnati, has completed construction and equipment of a new furnace department for heat treating gears and rolls for use in cold rolling ferrous and nonferrous metals. The company also has completed installation of a new department for finish grinding of rolls for cold rolling.

♦

Morgan Engineering Co., Alliance, O., has been awarded contract for constructing a 35-inch modern blooming mill for the Weirton Steel Co., part of the improvement plan at the Weirton, W. Va., works of the company. The mill is to be of the 2-high reversing type, the order including front and back mill tables and the manipulator.

♦

Harnischfeger Corp., Milwaukee, has appointed Plattner Welding Supply Co., Coffeyville, Kans., exclusive agent for P & H-Hansen electric arc welders and Smootharc welding electrodes. The Plattner company will operate under the supervision of Harnischfeger's Kansas City office.

♦

Pioneer Engineering & Mfg. Co., Detroit, manufacturer of coolant and lubricant pumps for industrial use, has appointed Harris Pump & Supply Co., Pittsburgh, exclusive representative in western Pennsylvania and northern West Virginia.

♦

Tishken Products, Detroit, manufacturer of roll forming machinery, has moved into its recently enlarged plant at 8531 Livernois avenue. It was designed and built by the Austin Co., Cleveland, in 1936, and an addition by the same company has just been completed. Paul Tishken started his production in 1921 in an "alley shop," 10 x 30 feet, later building an addition which brought it to 3500 square feet. His brother then was his only employe. At present he has 30 to 35 men on his payroll.

♦

William Sellers & Co. Inc., Philadelphia, manufacturer of machine tools, has engaged Clarke-Harrison Inc., management engineering firm, to take charge of all its operations, including research, design, engineering, manufacturing and sales. A modernization program now under way, covering products and plant, will be expedited, and the first part of this program, including improvement in planer design and construction, will be announced on or before Nov. 1.

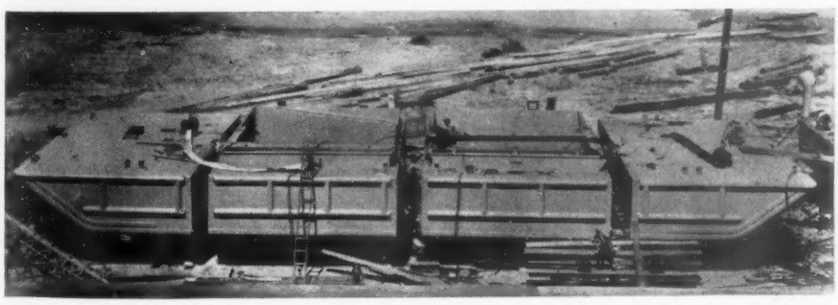
♦

Ahlberg Bearing Co., Chicago, has been appointed distributor for the entire United States for products of Bower Roller Bearing Co., Detroit. The latter has manufactured bearings for about 25 years, almost exclusively for automotive use. Distribution in the industrial field will be through the Ahlberg company, which will continue to supply RBC roller bearings, Norma-Hoffmann ball bearings, CJB master ball bearings and Ahlberg ground bearings. Each branch will maintain complete factory stock of all standard types and sizes and engineering service will be provided.

♦

The Kent Co., Rome, N. Y., manufacturer of floor machines and suction cleaners, is marking its twenty-fifth year. Started by a father and three sons, two of whom were graduate engineers from Lehigh university, the company has grown to many times its original size and has broadened its line of manufacture. Eugene M. Kent, the founder, died in 1924. Gordon E. Kent, youngest of the three sons, is president and general manager, Bert M. Kent, patent attorney in Cleveland, is vice president and director, and Fay T. Kent, the other son, is a large stockholder, living in New York.

## Builds Steel Scow in Four Sections



**■ Pacific Coast Engineering Co., Oakland, Calif., built this vessel for United States engineers by arc welding four separate water-tight sections. These were launched and bolted together. Easy, rigid construction, with deadweight considerably below conventional designs, are reported. Photo, Lincoln Electric Co., Cleveland**

# New Standards Are Approved

■ BETWEEN annual meetings of the American Society for Testing Materials many of its standing committees complete work on new standards, and a procedure has been established by which Committee E-10 on standards acts for the society.

Important recommendations have been approved as a result of the work of committee A-1 on steel, particularly on pipe and tubing materials. One noteworthy change was to issue revisions in the form of new tentative specifications to replace immediately the standard applying to lap-welded and seamless steel and lap-welded iron boiler tubes (A 83-36).

The new tentative specification (A 83-38 T) is significant because the committee has recognized the advantages of designating wall thicknesses by decimals in place of Birmingham wire gage and fractions, as well as the desirabilitty of indicating permissible variations for wall thickness and weight in percentages rather than by the existing dual system.

The former grade of medium carbon material in the specification was deleted and a new tentative specification for medium carbon seamless steel boiler tubes was approved (A 210-38 T). The use of this material and the desirability of making certain modifications in requirements indicated the necessity of a separate specification.

The demand for recognized standardized requirements for carbon-molybdenum seamless steel boiler and superheater tubes resulted in new tentative specifications for this material. The close co-operation of consumers and makers resulted in a favorable consensus on the new specification which will bear the designation A 209-38 T.

For some time, committee A-1 has been developing standardized requirements for spiral welded pipe and there has now been issued a new specification (A 211-38 T) covering spiral welded steel or iron pipe 4 to 48 inches in diameter inclusive, with wall thickness from 1/16-inch to 11/64-inch, manufactured by the following electric-fusion-welded processes: Spiral lap-welded joint, spiral lock seam welded joint, or spiral butt welded joint.

For spiral welded material greater than 3/16-inch in thickness, tentative revisions are being published in two existing specifications covering electric-fusion-welded steel pipe of sizes from 8 to 30 inches and sizes 30 inches and over.

### Ferroalloy Code Revised

The work of committee A-9 on ferroalloys—a complete review of nine existing specifications—resulted in a number of extensive changes and reissue in the form of new tentative standards. The committee believes the new specifications are representative of current commercial requirements. They cover the following: Spiegeleisen, ferromanganese, ferrosilicon, ferrochromium, ferrovanadium, molybdenum salts and compounds, ferromolybdenum, low-carbon ferromolybdenum and ferrotungsten.

To meet the demand for standard requirements for electrolytic cathode copper new tentative specifications (B 115-28 T) for this material were approved at the request of committee B-2 on nonferrous metals and alloys. The quality requirements provide that the copper shall have a minimum purity of 99.90 per cent, the silver being counted as copper. The copper is to have a resistivity not to exceed 0.15436 international ohms per metergram at 20 C., annealed, the resistivity to be determined from a representative sample of each carload, or 50 tons, as a lot.

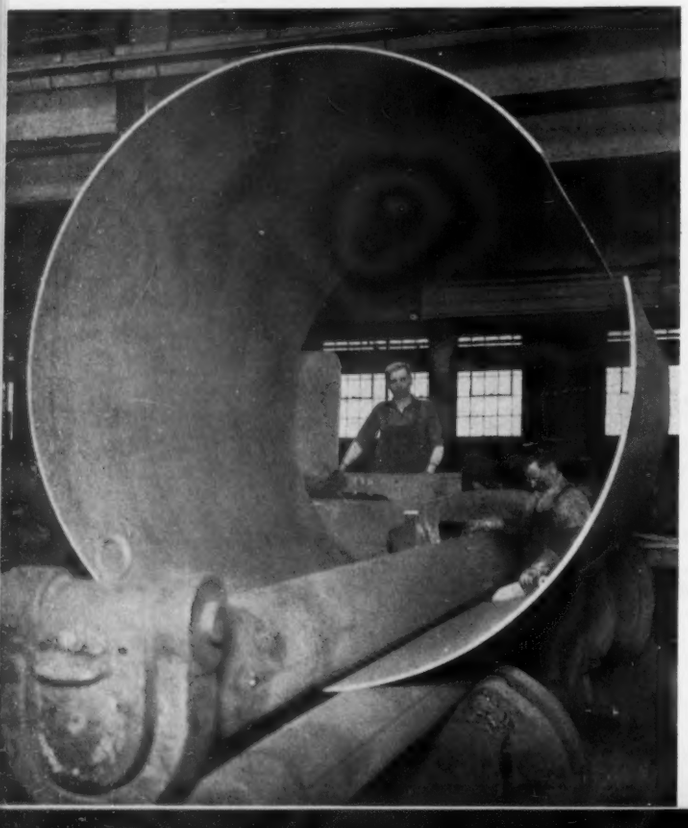
## September Iron Output Higher Than Estimate

■ Actual production of coke pig iron in the United States in September totaled 1,683,097 gross tons, this being 9042 tons higher than the partially estimated figure of 1,674,055 tons announced in STEEL last week. This was a gain of 187,583 tons, or 12.5 per cent, over the 1,495,514 tons produced in August.

Average daily production in September was 56,103 gross tons, which, compared with the 48,242-ton daily rate of August, was an increase of 7861 tons, or 16.3 per cent.

For the 9-month period this year, production has aggregated 12,322,785 gross tons, against 30,307,608 tons for the corresponding period of 1937.

Active furnaces on Sept. 30 numbered 97 instead of 98 as announced last week. Blowing out of one Pioneer furnace of Republic Steel Corp. in Alabama on Sept. 29 accounts for this difference. On the last day of August, 88 stacks were making iron, thus the increase of September was 9 furnaces.



◆

## Rolling Large Steel Shell

■ **The piece going through the rollers is a heavy section of sheet steel, bent into cylindrical shape in General Electric's Philadelphia plant. It will form the tank body for an oil circuit breaker**

## Chicago Purchasing Men Arrange Tenth Exhibition

■ Purchasing Agents' association of Chicago will conduct its tenth annual products' exposition at Hotel Sherman, Chicago, Nov. 16-17. The newest industrial products and services of members of the association will be displayed. A feature of the program will be several showings of the United States Steel Corp.'s technicolor motion picture "Steel—Man's Servant." The exposition will close with a banquet on the evening of Nov. 17 at which Frederick Snyder, journalist, will speak.

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■ Manufacturers of wire springs reported production valued at $72,019,823 in 1937, according to the biennial census of manufactures. This compares with $25,043,511 in 1935, and $24,104,363 in 1933.

# MEETINGS

### FOUR PAPERS ON INSTRUMENTATION

■ FOUR papers will be presented at the Conference on Instrumentation in the Steel Industry, sponsored by and to be held at Carnegie Institute of Technology, Pittsburgh, Oct. 13-14.

At the Thursday morning session on blast furnace instrumentation, a paper will be presented by John Mikaloff and Fred N. Hays, Carnegie-Illinois Steel Corp., Duquesne, Pa. The afternoon session on open-hearth instrumentation features presentation of a paper by E. T. W. Bailey, Steel Co. of Canada, Hamilton, Ont.

Friday morning's rolling mill instrumentation session will hear a paper by J. L. Whitten, Lee Wilson Engineering Co., Cleveland. At the Friday afternoon session on power department instrumentation, a paper will be read by W. Skinkle of Carnegie-Illinois Steel Corp., Pittsburgh.

### SCRAP CONVENTION JAN. 10-12

Institute of Scrap Iron and Steel will hold its annual convention in Hotel Jefferson, St. Louis, Jan. 10-12. E. C. Barringer, 11 West Forty-Second street, New York, is secretary.

### WILL CONSIDER RESEARCH

A dinner meeting will be held Oct. 17, Penn Athletic club, Philadelphia, under auspices of the Philadelphia district committee of the American Society for Testing Materials. Dr. L. W. Chubb, since 1930 director of research, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will speak on "Fundamental Research in Industry."

## Convention Calendar

**Oct. 10-11—Associated Machine Tool Dealers of America.** Annual meeting at Hotel Alms, Cincinnati. Thomas A. Fernley Jr., 505 Arch street, Philadelphia, is executive secretary.

**Oct. 10-12 — American Gear Manufacturers' association.** Twenty-first semi-annual meeting at Skytop lodge, Skytop, Pa. J. C. McQuiston, 701 Shields building, Wilkinsburg, Pa., is manager-secretary.

**Oct. 10-14—American Gas association.** Twentieth annual convention at auditorium, Atlantic City, N. J. Kurwin R. Boyes, 420 Lexington avenue, New York, is secretary.

**Oct. 10-14 — National Safety council.** Twenty-seventh national safety congress at Stevens hotel, Chicago. W. H. Cameron, 20 North Wacker drive, Chicago, is managing director.

**Oct. 11-14—American Institute of Steel Construction.** Sixteenth annual convention at French Lick Springs, Ind. V. G. Iden, 200 Madison avenue, New York, is secretary.

**Oct. 12-14—Porcelain Enamel institute.** Third annual forum at University of Illinois, Urbana, Ill. C. S. Pearce, 612 North Michigan avenue, Chicago, is secretary.

**Oct. 12-15 — Electrochemical society.** Meeting at Hotel Seneca, Rochester, N. Y. Dr. Colin G. Fink, Columbia university, New York, is secretary.

**Oct. 13-14—Carnegie Institute of Technology.** Conference on instrumentation in steel industry, at the Institute, Pittsburgh. Prof. Richard Rimbach, supervisor extension and evening courses, metallurgical department, is in charge.

**Oct. 13-15—American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, Western Society of Engineers.** Joint meeting on coal at Palmer House, Chicago.

**Oct. 13-15—Society of Automotive Engineers.** National aircraft production meeting at Ambassador hotel, Los Angeles. John A. C. Warner, 29 West Thirty-ninth street, New York, is secretary.

**Oct. 14-15—American Society of Tool Engineers.** Semiannual meeting at William Penn hotel, Pittsburgh. Ford R. Lamb, 2567 West Grand boulevard, Detroit, is executive secretary.

**Oct. 14-16 — National Association of Foremen.** Annual convention and exposition at Goodyear hall, Akron, O. Headquarters are at 232 Madison avenue, New York.

**Oct. 17-19 — National Association of Waste Material Dealers.** Fall convention in San Francisco. C. M. Haskins, 1109 Times building, New York, is secretary.

**Oct. 17-19 — Farm Equipment institute.** Forty-fifth annual convention at French Lick Springs, Ind. R. A. Jones, 608 South Dearborn street, Chicago, is secretary.

**Oct. 17-20—National Wholesale Hardware association.** Forty-fourth annual convention at Marlborough-Blenheim, Atlantic City, N. J. George A. Fernley, 505 Arch street, Philadelphia, is secretary.

**Oct. 17-20—American Institute of Mining and Metallurgical Engineers.** Fall meetings of Institute of Metals and Iron and Steel divisions at Book-Cadillac hotel, Detroit. Louis Jordan, 29 West Thirty-ninth street, New York, is assistant secretary.

**Oct. 17-21—American Society for Metals.** Twentieth national Metal congress and exposition at Statler hotel, Detroit. W. H. Eisenman, 7016 Euclid avenue, Cleveland, is secretary.

**Oct. 17-21—American Welding society.** Nineteenth annual meeting at Book-Cadillac hotel, Detroit. Miss M. M. Kelly, 33 West Thirty-ninth street, is secretary.

**Oct. 17-21 — Wire association.** Annual meeting at Detroit-Leland hotel, Detroit. R. E. Brown, 17 East Forty-second street, New York, is secretary.

**Oct. 17-21—Wire Machinery Builders' association.** Annual meeting at Detroit-Leland hotel. W. D. Pierson, Box 70, Waterbury, Conn., is secretary.

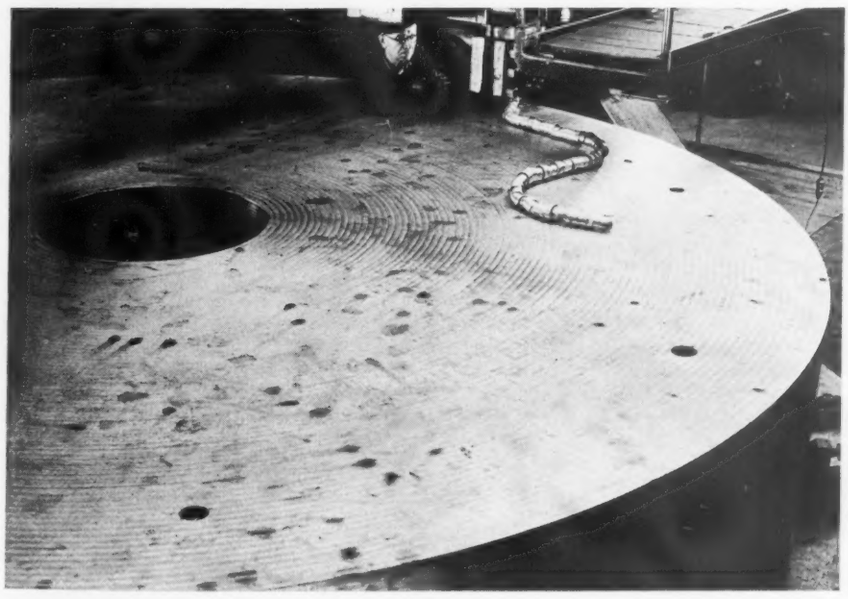
**Oct. 20-21—Construction League of the United States and United States chamber of commerce.** Construction industry conference at chamber of commerce headquarters, Washington.

**Oct. 21—Foundry Equipment Manufacturers' association.** Fall meeting at Cleveland hotel, Cleveland. Arthur J. Tuscany, 632 Penton building, Cleveland, is executive secretary.

**Oct. 24-27—American Mining congress.** Fifth annual metal mining convention and exposition at Ambassador hotel, Los Angeles. Julian D. Conover, 309 Munsey building, Washington, is secretary.

**Oct. 24-28—National Electrical Manufacturers' association.** Annual meeting at Palmer House, Chicago. R. J. Blais, 155 East Forty-fourth street, New York, is secretary.

## Shock Absorber for Steel



■ **This 190,000-pound flywheel is being "faced" in Westinghouse Electric & Mfg. Co.'s East Pittsburgh, Pa., works before it goes to work as a cushion of power in a steel company's blooming mill. Part of a large motor-generator unit, the flywheel, by means of its rotational energy, will maintain the generator at a steady power output despite peaks and recessions in its load requirements as steel ingots are pressed between the mill rolls**

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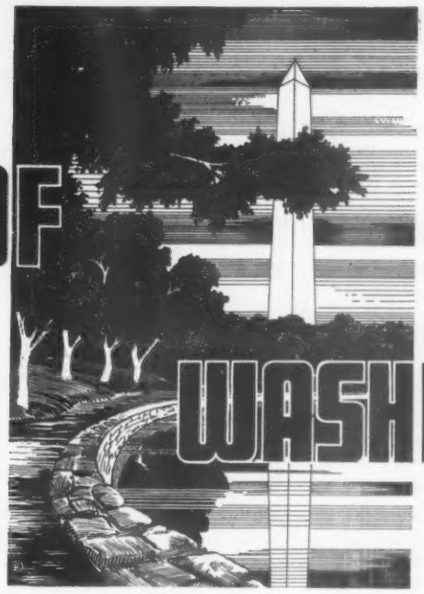
# WINDOWS OF WASHINGTON



BY L. M. LAMM
*Washington Editor, STEEL*

*WASHINGTON*

■ DESPITE the fact Elmer F. Andrews, hours and wages administrator, was prompt in appointing a textile industry committee, it is positive now that no minimum wage and maximum hour provision, even in this industry, will be promulgated before the new act is operative.

Mr. Andrews announced last week that he had selected places for 12 regional offices which he hopes to have in operation by Oct. 24 when the act goes into effect. They include: Boston, New York, Philadelphia, Richmond, Va., Cleveland, Chicago, Birmingham, Ala., or Atlanta, Ga., Minneapolis, Kansas City, Mo., Houston, Tex., Denver and San Francisco.

It is apparently not entirely understood by business interests that regardless of whether any industry committees have been set up, if a firm is doing business in interstate commerce it must abide by the law, which provides for a minimum rate of 25 cents an hour and maximum hours of 44 hours a week, unless overtime compensation is paid for work in excess of 44 hours, this compensation to be at the rate of one and a half times each employe's regular rate.

### Rules Not Yet Ready

Up to the time this is written, no regulations have been issued by the new Andrews division, although attorneys are working night and day to have some rules ready before Oct. 24. Mr. Andrews has unofficially expressed the view that the law applies to office workers and maintenance employes as well as others. However, as far as various occupational groups are concerned, there is no certainty regarding the extent of the statute's application.

It is not within the province of the administrator, according to the law, however, to determine by regulation or order precisely what classes of employes are affected except in a few limited cases where he has power to define and delimit certain excluded classes. There is no question, however, that certain portions of the act will have to be clarified both by administrative interpretation and court decisions.

Senator Burke, Nebraska, in Washington last week, predicted that congress will have to modify this act before the 40-hour week goes into effect. Having studied labor conditions in several European countries, the senator said effects of the 40-hour week in France have convinced him that a mandatory hours provision would prove unworkable in the United States.

### Short Week Not Practical

Senator Burke, who has just returned from Europe, said that France, which has been struggling to rearm, has found that it cannot compete economically with countries which have longer work weeks. For this reason, he said, the 40-hour week has practically been abandoned.

In a talk last week, Mr. Andrews said that this country had reached the point where the wage and hour standards of industry were about to be set by the least responsible employers in each industry.

"Fair employers," said Andrews, "who appreciate the folly of attempting to maintain a competent labor force at sweatshop wages and who also appreciate that American industry can't sell its products to a nation of wage earners receiving less than $700 a year, are up against competition of employers who were in business for the short, quick turnover only."

Discussing this matter further Mr. Andrews said: "In the discussions on the wage and hour bill last winter, certain opponents stated that its enactment would bring economic disaster to parts of our nation. It was stated that if certain industries in certain parts of the country had to pay a minimum of 25 cents an hour, those industries would have to close down. The opposition was determined and prolonged, but a very interesting thing seems to have happened.

"The opposition inadvertently passed along to wage earners the glad tidings that a wage higher than was being paid them was so much lower than the wage paid for similar work elsewhere in the country that other wage earners were protesting against this proposed higher wage as being too low even for a minimum. These low-paid earners, startled by this news, asked in effect how long this had been going on and insisted that this minimum wage, described by some as much too high and by others as much too low, be enacted into law. It seems to be that this was healthy economically and politically."

### PUT MONOPOLY HEARINGS OFF UNTIL ELECTION

Senator King, Utah, a member of the national economic committee, stated last week that he has been informed that data being assembled by various government agencies assisting the committee will not be ready for public hearings for a month or six weeks.

While the information cannot be confirmed, the story here is that an informal agreement has been reached by some members of the committee to delay public hearings at least until after elections. Whether it is because of the political situation or that government departments are not yet ready for hearings, it is felt definitely that they

have been delayed. There has been considerable difference of opinion among committee members for some weeks.

Hearings originally were scheduled to begin early this month. Whether there is any truth in the statement one member of the committee gave it as his opinion that this delay could be considered as an additional assurance to business that the investigators do not intend to make political capital of their findings.

While Leon Henderson, executive secretary of the economic committee, has been authorized to correlate facts developed by government departments' study of alleged monopolistic activities, Senator King is urging that experts from the Brookings Institute, a non-governmental organization, be employed because he believes additional help is needed.

Members of the committee, it is reported, do not agree on the trend of the investigation or proper treatment of monopolies. One committee member has expressed the belief that controlled monopolies ought to be increased rather than broken up. It is believed that conflicting opinions also exist between congressional and departmental members.

It is reported that the patent committee of the American Bar association, which is co-operating with the economic committee, is making progress. It is studying, among other things, patents controlled by large corporations.

Harry Semmes, a patent attorney of this city, heads this special committee. The other members of the committee are: Jo Bailey Brown, Pittsburgh; Lester Mann, Chicago; Roy Hackley Jr., San Francisco; and Richard Eyre, New York. These appointments were made by Thomas E. Robertson, ex-officio member and former commissioner of the patent office, who now heads the patents division of the American Bar association.

## ARMAMENT COSTS GRAVE THREAT TO GOVERNMENTS

The phenomenal increase of world armament expenditure from 4 billion dollars in 1933 to more than 17 billion in 1938 "has introduced a new and disturbing factor into world economy," which remains to plague world statesmen after the reprieve from immediate war, according to a survey of the economic consequences of rearmament, prepared by the foreign policy association.

With a general European war averted, or at least postponed, by the four-power conference in Munich, virtually every industrial country in the world is faced with the grave question of how long its national economy can stand the continued strain of vast armament expenditures which are "more than four times as large as they were in 1913."

The report, written by William T. Stone, points out that "the consequences are already apparent in both democracies and dictatorships. In paying for rearmament, dictatorships and democracies alike are confronted with unbalanced budgets, mounting deficits and the prospect of continued deficit financing."

In Great Britain, as in other countries, "the industrial structure is being distorted by the exigencies of rearmament. Expansion in the field of heavy industry began to be felt in 1936. During 1937 and 1938 direct government expenditures for 'shadow' factories, airdromes, naval vessels and aircraft equipment actually exceeded the total value of private houses constructed in Great Britain.

"France's rearmament program, while less costly than Britain's, has dominated the economic and financial situation of the nation to an even greater extent."

## HONEST INDUSTRY NEEDS AID AGAINST "CHISELERS"

There are three reasons for the almost universal disregard of the antitrust laws today, said Thurman Arnold, assistant attorney general, in a talk last week on the enforcement of the Sherman act. The first, he said, is ignorance—"the harvest of 40 years in which combinations in restraint of trade have been as immune from actual interference as a man driving 80 miles an hour along an unpatrolled road."

"The second," he said, "is the widespread feeling among business men that the antitrust laws are obsolete, like the old blue laws, and only brought out on special ceremonial occasions.

"The third and most important is the necessity of fighting fire with fire. In any competitive situation, if one organization turns buccaneer, self-preservation requires that others follow. Competition without effective antitrust enforcement is like a fight without a referee. In such a conflict the man with the brass knuckles will win. We cannot blame our great industrial organizers for this.

### Must Meet Competition

"In a hard played game an aggressive team must go as far as the imposition of penalties permits, or else it will lose to the team which does. The trouble has been that the referee has been absent from the American industries. I have no doubt that with regional offices strategically located and properly staffed we can make respect for the antitrust laws normal conduct of business men. It is equally certain, that we cannot police America with only the present corporal's guard.

"A third result of adequate enforcement organization would be the clarification of our legislative policies."

Mr. Arnold said further that the large organizations required today for efficient mass production have changed our conception of what is reasonable restraint of trade. "No one," he said, "desires to break them up where they are efficient. Nevertheless, their very size gives them great control over the price structure even where that size is justified. Too often price policies of large organizations are not linked with the distribution of their productive capacity. Productive plants will be designed for ten years. Price policies will be aimed at attaining the maximum amount of the standard national purchasing power over a short period. Great advertising costs, expensive and wasteful distribution systems will be designed to take business away from others rather than to distribute more goods by lowering prices. In such a situation, some means must be found to induce price policy aimed at distributing the capacity of the productive plant."

## HOOK DEMANDS NAMES OF "FASCISTS," "NAZIS"

Further investigation to disclose the names of "high industrialists" charged with aiding Fascists and Nazis in the United States is being urged by the National Association of Manufacturers.

Charles R. Hook, president of the N.A.M. and of the American Rolling Mill Co., in a letter to Martin Dies, chairman of the congressional committee investigating un-American activities, reported that the N.A.M. board of directors "formally directed that I urge upon you the fullest investigation of these charges so that the names of those giving financial support or moral encouragement to such alien movements can be identified before the public."

"We do not believe it is sufficient to stop with allegations against 'certain high industrialists,'" Mr. Hook added. "This must inevitably be a reflection upon all industrialists."

Such general charges, he added, like those made last fall and spring that business had deliberately precipitated the depression, stigmatize all business men "and the real culprits get off unscathed by not being singled out."

Asserting that the Dies committee already "has performed a genuine service in exposing the machinations of communism," Mr. Hook requested a similar exposure of "the extent to which Nazi and Fascist organizations are maneuvering under cover."

# Building Construction Aiding Lumber Industry, Substantial Steel Consumer

*SEATTLE*

■PROSPECTS for continued improvement in domestic lumber demand presages revival in steel requirements from that industry. Although lumber production in the Pacific Northwest during the first half this year was only 40 to 50 per cent of the 1926-29 average, demand has improved since July 1. Timbermen expect further gains through the remainder of the year, hope a long period of severe depression is past.

Steel consumption by the lumber industry is in direct proportion to the activity and prosperity of logger and lumber manufacturer. When lumber demand is active, the industry is lavish in its outlay for replacements and new equipment.

Although not ranking high among steel consumers, the lumber industry annually buys sizable tonnages of steel in transportation equipment, mill machinery and small tools. Practically all require considerable fabrication and special treatment.

From early days when logs were snaked from the woods with teams of oxen, the industry has progressed through the steam donkey stage, entered the diesel tractor stage.

Pacific coast plants have developed the skidder, yarder and loader in the drive toward specialized efficiency. A modern combination skidder and loader may weigh 300 tons, and is either steam or motor-powered. Some operate on logging railroads, others are portable rigs.

Mill owners have made similar progress in reducing operating costs and increasing efficiency through modern steel equipment.

Wear and tear on equipment in logging and lumbering is heavy. Leading equipment items for delivering logs to the mills include locomotives, wire rope, electric motors, tractors, lumber carriers or "straddle bugs," cranes, trucks, axes and saws.

**Expect Increased Demand**

Reasons for timbermen's expectations for better demand: Buying during the early part of this year was below consumption with the result stocks in the North Atlantic and Middle states are exceptionally low; activity of the federal housing administration is stimulating home building, especially in California and the East; good crops in the Middle West promise an active market; advance orders have firmed lumber prices at mills.

Unfavorable factors are the depressed condition of export business and lack of buying by railroads and industry. Railroads in the past have been one of the lumber industry's best customers but recently have been unable to finance any but the most necessary replacements. Lack of a foreign market, which ordinarily takes 16 to 20 per cent of lower grade output, has created an unbalanced condition which makes moving of the poorer stock difficult.

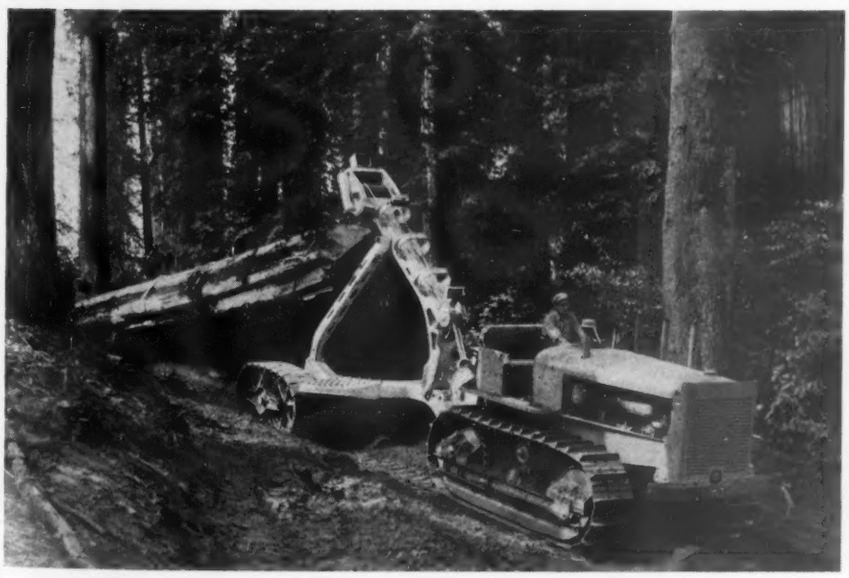
Much of the Pacific Northwest's lumber prosperity has been transferred to British Columbia. First cause for this is the differential established between Great Britain and her colonies which has practically barred United States lumber from the markets in Great Britain, Australia and South Africa.

The second is the reciprocal trade agreement with Canada which permits that country to ship lumber into the United States market, largely to North Atlantic states. This gives British Columbia lumbermen a great advantage as they may use low-rate foreign carriers to reach American market. Washington and Oregon millmen shipping by American vessels must pay $14 a thousand feet, a rate "pegged" by the maritime commission.

Under these conditions British Columbia has taken a commanding lead over the United States Pacific coast area in lumber exports. Before the all-British agreement, Washington and Oregon exported about 80 per cent of the lumber shipped abroad. In the first six months this year, British Columbia's exports totaled 516,890,087 feet; Washington and Oregon in the same period shipped only 158,678,975 feet, or 23.49 per cent.

In the same period, Australia, formerly one of the largest markets for Washington and Oregon timber, purchased 66,166,834 feet from British Columbia and only 23,352 feet from Washington mills; mills on the Canadian side sent 368,938,079 feet to Great Britain, which bought only 16,000,000 feet from Washington and Oregon.

Military operations in China are holding shipments to the Orient to a minimum. In the first six months of 1938, Japan's purchases were off 100,000,000 feet from the first half in 1937; China's imports were cut in half.

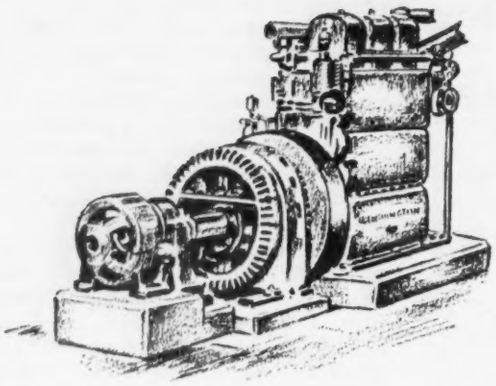


■ **A yarder, built by Pacific Car & Foundry Co., Seattle, grips and lifts a heavy log, towed by an Allis-Chalmers tractor. After long depression, the lumber industry, liberal spender for mechanization in normal times, is more hopeful**

## Tin, Terne Plate Output Up 42.9 Per Cent in 1937

■ Production of tin plate and terne plate showed considerable increase in 1937, compared with 1935, according to the biennial census of manufactures, just reported. Production in 1937 was 6,022,908,392 pounds valued at $278,380,420, compared with 4,216,002,467 pounds valued at $192,323,404 in 1935. This was an increase of 42.9 per cent in volume and 44.7 per cent in value.

Tin plate in 1937 amounted to 5,433,508,428 pounds valued at $254,389,941 and terne plate to 589,399,964 pounds valued at $23,990,479. Producing establishments in 1937 numbered 34 compared with 32 in 1935.



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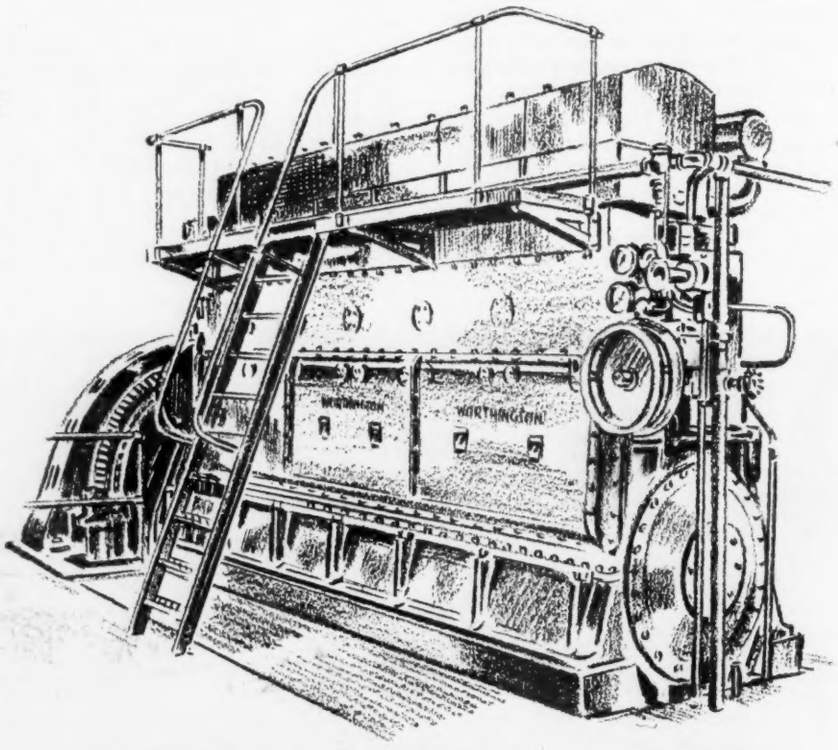

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# MIRRORS OF MOTORDOM

*DETROIT*

■ EYES are focussed on Dearborn these days, with the motor industry anxiously waiting to see what Henry Ford will offer the public for 1939. First assemblies started to roll last week and by the end of this month there should be official word on Ford models. A good-size purchase of steel, probably for some 50,000 cars, was being cleared last week, and the Ford organization appeared to be taking on a good bit of activity over the approaching season.

Best information obtainable through grapevine channels is that Ford will have four lines available in 1939 models—60 and 85-horsepower standards; 85-horsepower deluxes, and the new 100-horsepower Mercury.

Standard models will have bodies changed only slightly from this year's deluxe style, with the so-called "inverted canoe" hood. The deluxe bodies are entirely new and follow closely the pattern set by this year's Lincoln Zephyr, except that there will be no dividing strip in the center of the low radiator grille, the latter sweeping unbroken across the lower front end.

**Mercury Refines 1938 Deluxe Line**

The Mercury, not yet in production according to reports, will be a refinement of the deluxe line, on 116-inch wheelbase, with about the only change in the motor a ⅛-inch increase in bore. One model of the Mercury seen here had front fenders which extended down well over the wheels on the side.

It is reported Ford is using steel cylinder liners on about 5 per cent of present engine production, and is extending this development gradually. These sleeves are said to be of deep drawn steel, 3/64-inch thick, formed with a lip on the upper rim, nitrided for hardness, press fitted to the block and burnished smooth.

**BY A. H. ALLEN**
*Detroit Editor, STEEL*

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Such liners have been used for some months on reconditioned engines and by adopting a uniform size of sleeve it is possible to bore out all old engines to the same cylinder diameter, fit the sleeves and use a single size of replacement piston. This arrangement saved considerably on cost of fitting up pistons and gave an ideal combination of fully seasoned block plus hard cylinder walls. Reconditioned engines also have bushed crankshaft bearings and cast valve seat inserts on both intake and exhaust valves.

In fact, for a cost of somewhat over $60, installed, a Ford owner can have a fully rebuilt power plant which some engineers say they would prefer to a new engine.

Use of the steel liners in cylinders is claimed to overcome all complaints on the score of excessive oil consumption. In this connection, some interesting comments are heard about tests on oil consumption. One deals with some experiments a piston ring manufacturer carried out, which showed that overtightening of nuts on engine heads produced enough distortion to result in a 300 per cent increase in oil consumption.

Another comment is that the top quart of oil in a Ford engine apparently is consumed several

## Light Hupmobile Follows Cord Lines

■ **Using body dies originally developed for the Cord, this 115-inch wheelbase, 6-cylinder Hupmobile will be offered in the low-price field for 1939. Bearing a striking resemblance to the Cord, it is of the conventional rear-drive type.**

**See text page 62**

times as rapidly as the remainder of the oil. One explanation is that with the use of full-floating crankpin bearings, slotted to allow oil to pass through onto the connecting rod, any slight wear in the bearing results in about twice as much oil being thrown on the cylinder wall as with other types of engines.

■ WILLYS previewed its 1939 models about ten days ago and revealed a trend toward building a somewhat larger car, without at the same time increasing cost. In fact, Willys' prices were reduced some months ago. Hydraulic brakes on the Willys now signalize the complete disappearance of mechanical brakes from the passenger car field. Aluminum pistons replace the former cast iron type. Bodies are longer and the hood extends somewhat farther forward at the top, following to a certain extent the style set by Graham.

At the recent preview of Chevrolet models for 1939, M. E. Coyle, general manager, Chevrolet division of General Motors, told press representatives that he considered a 20 per cent improvement in 1939 automobile sales over the 1938 total well within expectation, although the industry recognized that numerous political and economic factors might add to or detract from this estimate.

**Quota 25 Per Cent Above 1938**

Chevrolet led the field in sales for 1938 models, estimates indicating a total of over 600,000, not including export volume or Canada. A goal of 750,000 has been set for 1939 models, and dealers meeting here were confident they could make this figure.

New Chevrolet models, probably to be announced about Oct. 22, are conservatively styled, compared with some other 1939 offerings. The radiator grille, an assembly of steel stampings chrome plated, has been deepened and narrowed so that it suggests the Cadillac 60 design.

Catwalk grilles are confined to a small square of louvers stamped in the steel and not trimmed or otherwise set off from the bodies. A mechanical gearshifting on the steering column will be available at $10 extra cost, and it is believed most buyers will want it included. The shift differs from some of the others being supplied on new models in that it is connected with a vacuum booster arrangement which makes its operation considerably easier when the motor is in operation.

At the preview, one of the Master series models was fitted out with every type of gadget imaginable, and made a great hit with newspaper men. Included were steel sunshades over all windows, insect screens over the front wing windows, a floating compass attached to the windshield dividing strip, two sets of horns for city and country driving, spotlight, foglight, cigaret case with automatic discharge, lighter, radio with automatic tuning, heater with a separate unit for defrosting the windshield, sunshade attached to driver's sun visor, retractable ashtray, and probably several more which this observer missed. On display among a group of accessories was an automatic windshield washer which gas station attendants are undoubtedly pulling for as standard equipment.

Front springing on deluxe Chevrolet models is of the parallelogram-

## Automobile Production

**Passenger Cars and Trucks—United States and Canada**

**By Department of Commerce**

| | 1936 | 1937 | 1938 |
|---|---|---|---|
| Jan. | 377,244 | 399,186 | †227,130 |
| Feb. | 300,810 | 383,900 | †202,589 |
| March | 438,943 | 519,022 | †238,598 |
| April | 527,625 | 553,231 | 238,133 |
| May | 480,518 | 540,377 | 210,183 |
| June | 469,368 | 521,153 | 189,399 |
| July | 451,206 | 456,909 | 150,444 |
| Aug. | 275,934 | 405,072 | †96,936 |
| 8 mos. | 3,321,648 | 3,778,850 | 1,553,412 |
| Sept. | 139,820 | 175,630 | *90,000 |
| Oct. | 230,049 | 337,979 | |
| Nov. | 405,799 | 376,629 | |
| Dec. | 518,958 | †347,349 | |
| Year | 4,616,274 | 5,015,974 | |

†Revised. *Estimated.

Estimated by *Ward's Reports.*

| Week ended | |
|---|---|
| Sept. 3 | 22,165 |
| Sept. 10 | 17,485 |
| Sept. 17 | 16,100 |
| Sept. 24 | 20,390 |
| Oct. 1 | 25,405 |

(For production in the week ended Oct. 8, please turn to page 224.)

axle type with open coil springs. This is new for Chevrolet, former type of independent suspension system being of the enclosed or Dubonnet type.

■ ILLUSTRATION of the new Hupmobile 6, shown on the preceding page, indicates how closely the lines of the former Cord have been followed in this new model. This 101-horsepower 6-cylinder model is on 115-inch wheelbase with conventional rear axle drive. Identical bodies will also be available on a chassis powered with a 4-cylinder engine, both likely selling well under $1000.

Some changes were made in the dies purchased from Cord Corp. for production of this new Hupp model. Headlights were molded into the front-end design, although not of the flush-mounted type. Front fenders were completely redesigned. Top is all steel, only 60½ inches off the ground. Tread is 61 inches rear and 56 inches front. Gearshift is mounted on the steering column, as it is on the two larger Hupp models, a six and an eight, which follow closely the lines of the 1938 models.

■ DODGE has released specifications on its new models; they feature catwalk cooling with two sets of horizontal louvers rather high up on the radiator front. Bodies are entirely new, in common with those for De Soto and Chrysler, featuring the smooth or "fast" back with flush type trunk compartments. Lamps are streamlined into fenders as in other new Chrysler models.

Coil springs are used on the front suspension, calling for a heavier front end to the frame. Steering mechanism has neither Pitman arm nor drag link, but employs a Y-shaped steering arm moving horizontally crosswise to the frame. Steering, basically of the worm and roller tooth type, is said to be 28 per cent easier, due to mechanical features and a change in ratio from 14.6 to 18.2. Wheels, pierced for four chain straps, use a thicker steel section. Lower edges of doors flare out to increase the streamlining effect by narrowing the running boards, and also to provide a better weather seal. Rotary door latches are new and permit much easier closing of doors.

■ PASSING of Charles E. Duryea has removed another from the ranks of automotive pioneers. The 76-year old veteran shared with Elwood Haynes the distinction of being the builder of the first gasoline automobile in this country, his first vehicle appearing on the streets of Philadelphia in 1892. His third car had pneumatic tires, a 2-cylinder engine and was placed on the market in 1895, by the Duryea Motor Wagon Co., Springfield, Mass. As early as 1894 the Duryea car had throttle control, spray carburetor, advanced spark ignition, ball bearings, artillery wheels and gear transmission with the present conventional speeds. He built cars from 1892 until 1914, retiring to become consulting engineer and patent expert.

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■ Production of horseshoes in the United States in 1937 totaled 220,306 kegs of 100 pounds each, a decrease of 11.3 per cent from 1935 and 72.9 per cent from 1925, according to the biennial census of manufacturers. Production in 1929 was 812,730 kegs. With the exception of a slight increase in 1933 compared with 1931 each biennial census year since 1929 has shown a decline.

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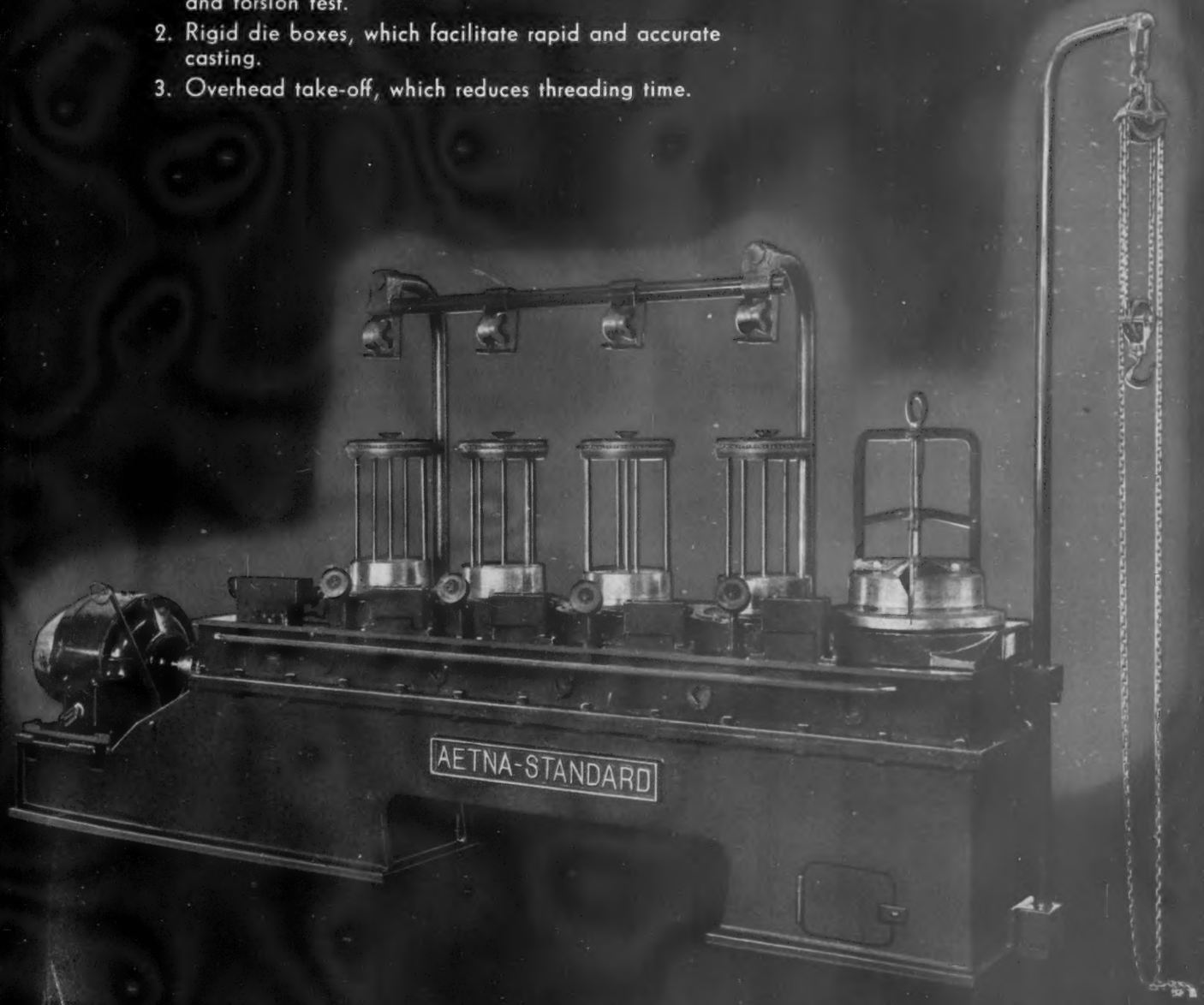
3. Overhead take-off, which reduces threading time.

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# EDITORIAL

## *Steel Finds a New Outlet*

■ OF WIDE significance is the appointment of Bert L. Wood (STEEL, Oct. 3, p. 21) as the American Iron and Steel institute's engineer in charge of a new program for promoting broader use of light steel construction in buildings. Recent progress in this direction indicates that a campaign of co-operation and education is all that is needed to open vast new markets.

Recently the institute estimated that the average $4000 house contains nearly four tons of ferrous materials. Cast iron products come to 4250. The average amount of steel used is 3620 pounds, composed of 1160 pounds of metal lath, 440 pounds of nails, 418 pounds of galvanized gutters and downspouts, 200 pounds of flashings, 175 pounds of electrical conduit, 65 pounds of light structural shapes, 60 pounds of hardware, 13 pounds of smokepipe, 950 pounds of pipe and fittings and 13 and 15 pounds of sheets, respectively, in the hot water tank and the bathroom medicine cabinet.

### Clairton Houses Use More Steel, Pointing to Added Applications

That steel is adaptable as material for many additional conventional building applications is reflected strikingly in the $3990 to $5310 homes now under construction at Clairton, Pa., for sale to workers at the new Irvin plant of Carnegie-Illinois Steel Corp. While the steel company is in no way connected with the actual building and sale of the houses, it co-operated in the development of building parts made from rolled steel. As a result, the Clairton houses contain about two and a half times as much steel as the average low-cost house.

The Clairton houses will have shutters, cornices, corner pieces, unit window frames, trim and porch hoods all fabricated from enameling sheets. Stairs to basement and second floor will be formed of sheet steel. Stair rails will be twisted bars. Enameling sheets will be used extensively in the bathroom and kitchen. In the bathroom they will form portions of the walls. Bathtub, lavatories and sink will be of this material. All closets will be of sheet steel, as also will be radiator covers. The ribbon supporting second floor beams will be a rolled product. The houses will be insulated with Ferro-Therm, a terne plate product which has a high heat reflecting characteristic. Structural beams and pipe columns will be used in the cellar.

The steel products used in this project, approved by the federal housing administration as suitable and acceptable building materials, made their way in competition with other materials on a strictly cost basis.

### Promotion of Steel Homes of Wide Benefit to Metal Industry

In addition to steel's replacement of other materials in such building parts as mentioned above, progress continues to be made in the development and sale of steel houses and various prefabricated steel building units. Latest development of this character was the completion near Cleveland of the first of a new type of all-steel house that sells, erected, at $2500 for a layout comprising living room, dinette, kitchenette, bathroom and two bedrooms complete with heating, plumbing and other equipment. This house contains about four tons of steel.

The market thus offered is a huge one. The division of economic research of the department of commerce some time ago calculated that this country will need about 600,000 new homes a year over the next decade. With a minimum of four tons of steel per low-cost house, this would mean a market, more than half of which is new, for 2,400,000 tons of steel a year.

Such promotional work benefits not only the steel industry. Its results spread out fanwise throughout the metalworking industry, providing new work to many establishments and to the manufacturers of the equipment of different types necessary for converting steel into buildings or building materials.

# THE BUSINESS TREND

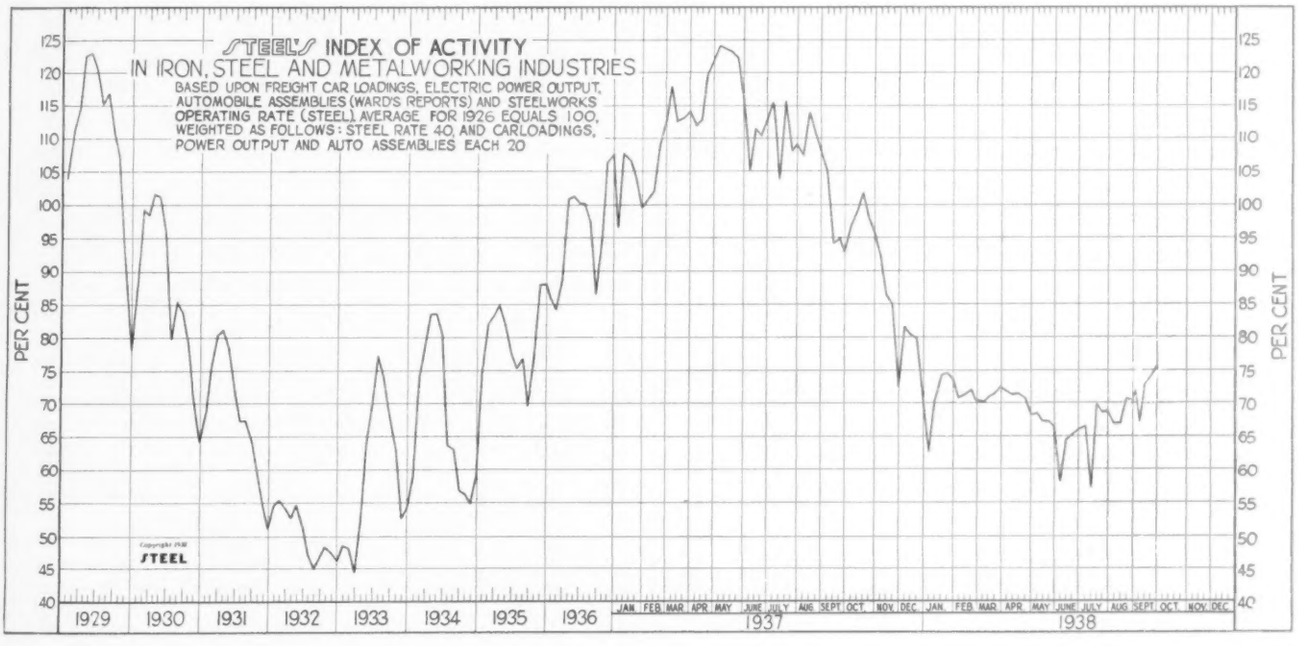
## Activity Index Touches New High for 1938

■ REFLECTING moderate gains in three of the four barometers from which it is composed, STEEL's index of activity in the iron, steel and metalworking industries advanced 1.8 points to 75.7 per cent in the week ended Oct. 1. This recent increase not only represents the third consecutive weekly advance, but also forced the index into new high levels for any week this year. A year ago the index stood at 96.6. Further comparisons seem to indicate industrial activity appears to be closely following the pattern set during the fall of 1935.

Steelmaking operations suffered the first decline in 16 weeks, excluding holiday periods. The national rate of 47 per cent in the week ended Oct. 1 constitutes a decline of 1 point from the preceding week and remains well below the 74 per cent recorded in the identical week last year. Despite the mild reaction in the rate of steelworks operations encouraging gains are expected through October, reflecting in part the anticipated substantial tonnage requirements from automotive builders and suppliers for the 1939 models.

Automotive assemblies during the week ended Oct. 1 recorded the second week of good advance, when output rose to 25,405 units, compared with 20,390 in the preceding week and with 45,830 a year ago. Another decided advance is anticipated during the week ended Oct. 8, with Chevrolet and others gradually stepping-up production schedules on new models. Early estimates for October place assemblies at approximately 300,000 units. This would be a decline of about 11 per cent from the total of 337,979 completed in October, 1937. However, it represents the best comparative showing of any month so far this year.

Although the pace of industrial activity built up during the summer months has lost some of its momentum,


STEEL'S INDEX OF ACTIVITY
IN IRON, STEEL AND METALWORKING INDUSTRIES
BASED UPON FREIGHT CAR LOADINGS, ELECTRIC POWER OUTPUT, AUTOMOBILE ASSEMBLIES (WARD'S REPORTS) AND STEELWORKS OPERATING RATE (STEEL) AVERAGE FOR 1926 EQUALS 100, WEIGHTED AS FOLLOWS: STEEL RATE 40, AND CARLOADINGS, POWER OUTPUT AND AUTO ASSEMBLIES EACH 20
PER CENT
125 120 115 110 105 100 95 90 85 80 75 70 65 60 55 50 45 40
1929 1930 1931 1932 1933 1934 1935 1936
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
1937
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
1938
STEEL

*STEEL'S index of activity gained 1.8 points to 75.7 per cent in the week ended Oct. 1:*

| Week ending | 1938 | 1937 | 1936 | 1935 | 1934 | 1933 | 1932 | 1931 | 1930 | 1929 |
|---|---|---|---|---|---|---|---|---|---|---|
| June 25 | 66.0 | 112.8 | 101.9 | 78.4 | 81.8 | 73.9 | 51.6 | 70.6 | 94.0 | 120.0 |
| July 2 | 66.5 | 115.3 | 97.5 | 64.1 | 79.4 | 77.0 | 49.2 | 64.1 | 75.0 | 107.8 |
| July 9 | 57.1 | 103.8 | 100.9 | 76.5 | 52.3 | 71.4 | 41.7 | 69.4 | 86.9 | 116.8 |
| July 16 | 69.9 | 115.7 | 99.9 | 79.8 | 67.8 | 79.1 | 46.9 | 70.0 | 79.1 | 115.5 |
| July 23 | 68.7 | 108.0 | 102.1 | 80.8 | 68.1 | 79.4 | 51.5 | 69.7 | 78.7 | 120.8 |
| July 30 | 69.0 | 109.1 | 102.5 | 78.4 | 66.4 | 78.8 | 46.1 | 68.9 | 79.2 | 117.3 |
| Aug. 6 | 66.9 | 107.3 | 98.7 | 73.4 | 64.6 | 75.9 | 45.1 | 67.0 | 85.6 | 117.2 |
| Aug. 13 | 66.9 | 113.8 | 92.6 | 77.5 | 64.6 | 74.7 | 44.6 | 67.4 | 86.2 | 116.8 |
| Aug. 20 | 70.5 | 110.3 | 97.7 | 77.0 | 61.4 | 74.2 | 44.9 | 67.3 | 88.5 | 116.4 |
| Aug. 27 | 70.3 | 108.5 | 94.0 | 77.3 | 60.3 | 71.6 | 45.2 | 66.5 | 87.4 | 116.9 |
| Sept. 3 | 72.3 | 104.8 | 87.5 | 70.9 | 55.1 | 70.3 | 45.4 | 65.3 | 79.0 | 106.3 |
| Sept. 10 | 66.8 | 94.3 | 83.1 | 70.1 | 53.5 | 65.5 | 44.9 | 60.9 | 85.9 | 114.0 |
| Sept. 17 | 72.9 | 95.0 | 90.1 | 69.4 | 58.7 | 69.1 | 47.8 | 65.6 | 86.2 | 112.2 |
| Sept. 24 | 73.9* | 93.0 | 86.2 | 68.5 | 58.1 | 68.2 | 48.0 | 65.2 | 83.8 | 110.7 |
| Oct. 1 | 75.7* | 96.6 | 89.0 | 73.3 | 59.3 | 66.9 | 47.7 | 62.4 | 81.0 | 109.1 |

*Preliminary.

the settlement of the immediate problems disturbing Europe point to a possible vigorous resumption of the general business uptrend. If the production schedules on 1939 automobile models proceed as anticipated, the automotive industry should once more be an important factor in stimulating further progress toward recovery.

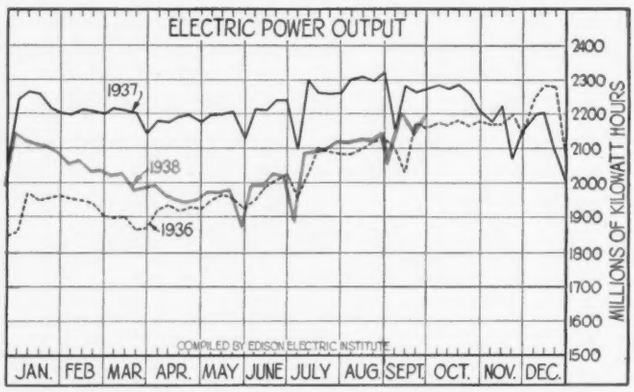
### FOREIGN TRADE INCREASED DURING AUGUST

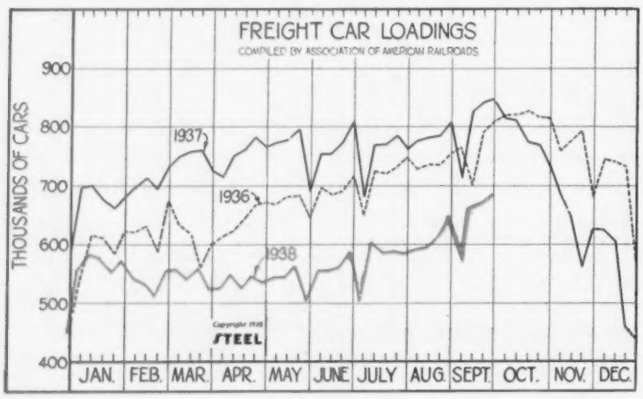
The general improvement which had taken place in business during August is evidenced further in the foreign trade statistics for the month. Imports aggregated $165,540,000, compared with $140,836,000 in July and $245,668,000 in August, 1937. Exports totaled $230,621,000 in August, against $227,577,000 in July and $277,031,000 in August last year. Every month of the current year has had a heavy balance of exports. However, the August excess of $65,081,000 is the smallest of the year, comparing with $86,741,000 in July, $86,781,000 in June and $100,000,000 or more in the earlier months of the year.

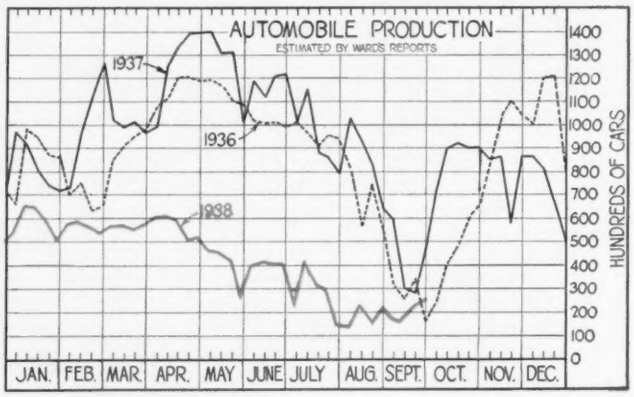
Contrary to the general trend, steel and iron exports during August of 242,139 tons valued at $10,285,480 registered a slight decline from the 263,699 tons valued at $11,500,284 exported during July. However, imports during August increased to 20,041 tons compared with 14,728 tons in July and with 61,489 tons in August, 1937. For the first eight months this year both exports and imports of iron and steel were substantially below the comparable period a year ago.

### PIG IRON OUTPUT UP 15.7 PER CENT

Average daily coke pig iron output in the United States in September amounted to 55,802 gross tons, a gain of 7560 tons over the August rate of 48,242 tons. This was the highest daily output since November, 1937, with 66,901 tons. September daily average production last year was 113,932 tons. Relating production to capacity, operation in September averaged 40.2 per cent, against 83.7 per cent in September, 1937. The number of furnaces in blast on Sept. 30 totaled 98, compared with 88 in August and 181 in operation at the end of September a year ago.

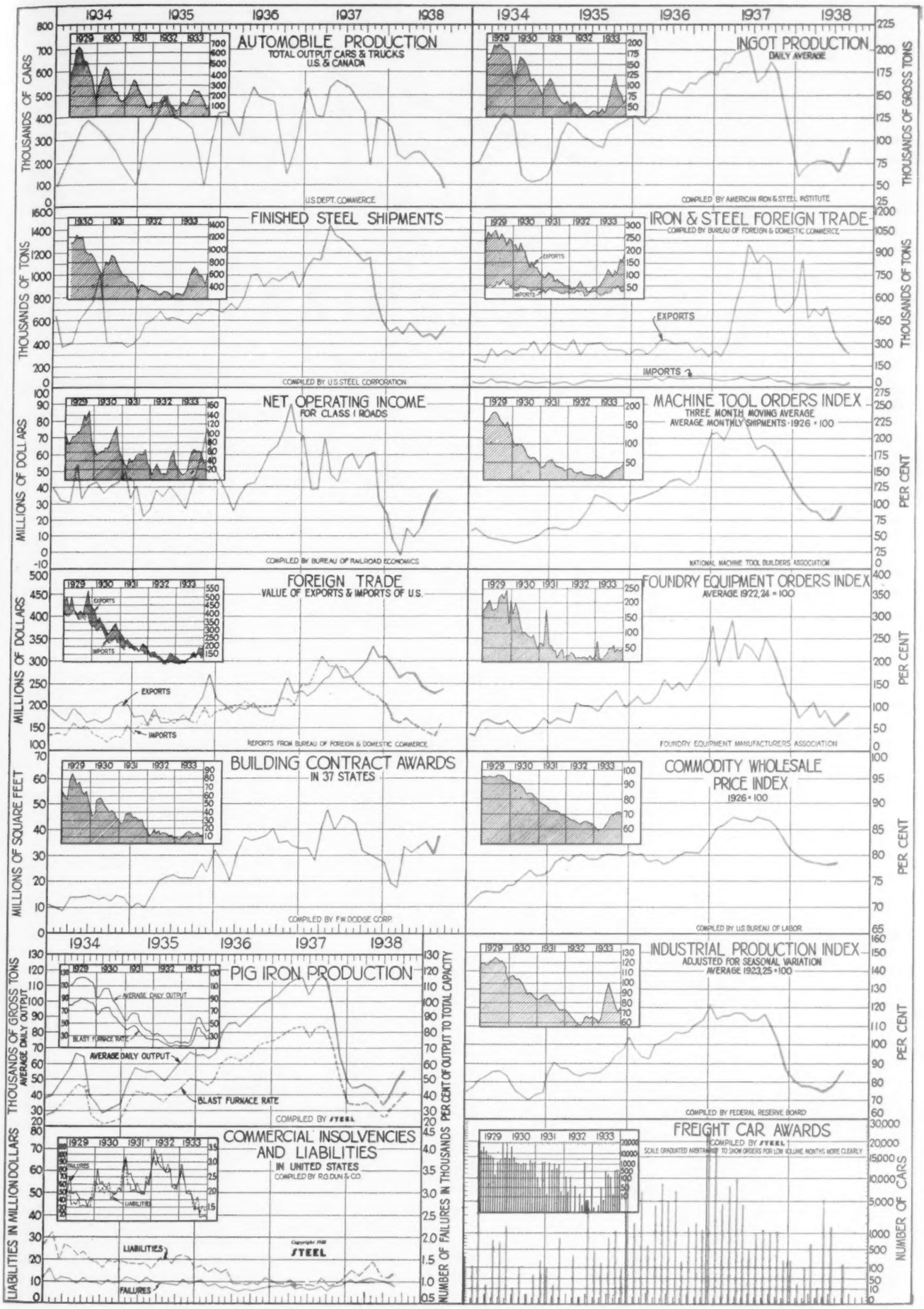



| Week ending | Steelworks Operating Rate Per Cent 1938 | 1937 | 1936 | Electric Power Output Million KWH 1938 | 1937 | 1936 | Freight Car Loadings 1938 | 1937 | 1936 | Weekly Auto Output 1938 | 1937 | 1936 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| June 25 | 28.0 | 74.0 | 71.5 | 2,019 | 2,238 | 2,029 | 558,937 | 773,733 | 713,639 | 40,918 | 121,032 | 99,695 |
| July 2 | 28.0 | 77.5 | 66.0 | 2,014 | 2,238 | 1,956 | 588,864 | 806,168 | 649,759 | 40,945 | 122,890 | 100,697 |
| July 9 | 24.0 | 74.0 | 69.5 | 1,881 | 2,096 | 2,029 | 501,013 | 682,205 | 724,324 | 25,375 | 100,981 | 97,833 |
| July 16 | 32.0 | 82.0 | 68.5 | 2,084 | 2,298 | 2,099 | 602,300 | 770,075 | 720,402 | 42,010 | 115,380 | 91,317 |
| July 23 | 36.0 | 81.0 | 70.5 | 2,084 | 2,258 | 2,088 | 580,882 | 770,980 | 731,062 | 32,070 | 88,055 | 96,863 |
| July 30 | 37.0 | 84.0 | 71.5 | 2,093 | 2,256 | 2,079 | 588,703 | 782,660 | 747,551 | 30,390 | 86,448 | 95,970 |
| Aug. 6 | 40.0 | 84.5 | 71.5 | 2,115 | 2,261 | 2,079 | 584,050 | 769,706 | 728,293 | 14,771 | 78,736 | 81,804 |
| Aug. 13 | 40.0 | 84.0 | 70.5 | 2,133 | 2,300 | 2,093 | 589,561 | 777,382 | 736,497 | 13,790 | 103,250 | 56,679 |
| Aug. 20 | 41.5 | 81.0 | 72.0 | 2,138 | 2,304 | 2,125 | 597,918 | 781,247 | 734,973 | 23,940 | 93,339 | 73,709 |
| Aug. 27 | 43.5 | 83.0 | 73.0 | 2,134 | 2,294 | 2,135 | 620,511 | 787,373 | 753,742 | 18,700 | 83,310 | 53,937 |
| Sept. 3 | 44.5 | 83.0 | 71.5 | 2,148 | 2,320 | 2,098 | 648,039 | 804,633 | 764,680 | 22,165 | 64,200 | 31,628 |
| Sept. 10 | 41.5 | 72.0 | 69.5 | 2,048 | 2,154 | 2,028 | 568,887 | 711,299 | 699,859 | 17,485 | 59,017 | 26,750 |
| Sept. 17 | 46.0 | 80.0 | 72.5 | 2,214 | 2,280 | 2,170 | 660,142 | 826,565 | 789,510 | 16,100 | 30,150 | 33,165 |
| Sept. 24 | 48.0 | 76.0 | 73.0 | 2,146* | 2,265 | 2,157 | 675,553† | 840,446 | 807,070 | 20,390 | 28,030 | 15,680 |
| Oct. 1 | 47.0 | 74.0 | 74.5 | 2,200* | 2,275 | 2,169 | 685,000* | 847,245 | 819,126 | 25,405 | 45,830 | 22,800 |

*Preliminary. †Revised.


AUTOMOBILE PRODUCTION
TOTAL OUTPUT CARS & TRUCKS U.S. & CANADA
U.S. DEPT. COMMERCE
THOUSANDS OF CARS
INGOT PRODUCTION
DAILY AVERAGE
COMPILED BY AMERICAN IRON & STEEL INSTITUTE
THOUSANDS OF GROSS TONS
FINISHED STEEL SHIPMENTS
COMPILED BY U.S. STEEL CORPORATION
THOUSANDS OF TONS
IRON & STEEL FOREIGN TRADE
COMPILED BY BUREAU OF FOREIGN & DOMESTIC COMMERCE
EXPORTS
IMPORTS
NET OPERATING INCOME
FOR CLASS I ROADS
COMPILED BY BUREAU OF RAILROAD ECONOMICS
MILLIONS OF DOLLARS
MACHINE TOOL ORDERS INDEX
THREE MONTH MOVING AVERAGE
AVERAGE MONTHLY SHIPMENTS 1926 = 100
NATIONAL MACHINE TOOL BUILDERS ASSOCIATION
PER CENT
FOREIGN TRADE
VALUE OF EXPORTS & IMPORTS OF U.S.
REPORTS FROM BUREAU OF FOREIGN & DOMESTIC COMMERCE
FOUNDRY EQUIPMENT ORDERS INDEX
AVERAGE 1922,24 = 100
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION
BUILDING CONTRACT AWARDS
IN 37 STATES
COMPILED BY F.W. DODGE CORP.
MILLIONS OF SQUARE FEET
COMMODITY WHOLESALE PRICE INDEX
1926 = 100
COMPILED BY U.S. BUREAU OF LABOR
PIG IRON PRODUCTION
AVERAGE DAILY OUTPUT
BLAST FURNACE RATE
COMPILED BY STEEL
THOUSANDS OF GROSS TONS AVERAGE DAILY OUTPUT
PER CENT OF OUTPUT TO TOTAL CAPACITY
INDUSTRIAL PRODUCTION INDEX
ADJUSTED FOR SEASONAL VARIATION
AVERAGE 1923,25 = 100
COMPILED BY FEDERAL RESERVE BOARD
COMMERCIAL INSOLVENCIES AND LIABILITIES
IN UNITED STATES
COMPILED BY R.G. DUN & CO.
LIABILITIES
FAILURES
LIABILITIES IN MILLION DOLLARS
NUMBER OF FAILURES IN THOUSANDS
Copyright 1938 STEEL
FREIGHT CAR AWARDS
COMPILED BY STEEL
SCALE GRADUATED ARBITRARILY TO SHOW ORDERS FOR LOW VOLUME MONTHS MORE CLEARLY
NUMBER OF CARS

# Electric MODERNIZATION

## Old wiring too small for modern loads and with badly deteriorated insulation is revealed as hidden source of profit loss in many plants

By FRED MERISH
Pompton Lakes, N. J.

IN A PREVIOUS survey made for STEEL, excessive heat losses were found to be an indication of inefficient boiler room equipment. So also heat loss in cables, and conduit ducts is an indication of excessive energy losses in electrical systems. This was much in evidence in a recent survey on adequate wiring and lighting in plants where production and processing of steel were under way.

Many plants visited had been using the same wiring systems for years although plant additions had been built from time to time. In many cases, it would have cost less to redesign the existing system, eliminating the jigsaw puzzle of wires, cables and conduits that had been thrown together hit-or-miss to meet expanding plant conditions. Current bills in these plants were high because heat losses from wires and cables were high. Heat losses mean energy is being consumed that should reach machines and other productive equipment.

With more copper used in wire and cable, there is less heat and energy loss in the lines, so it pays to use conductors of ample capacity. Manufacturers of wire and cable have made many improvements to their products in recent years to aid economical and uninterrupted operation. Too few steel plants are making use of these new materials.

Coupled with energy loss due to inadequate wiring, we received reports of voltage drop which slowed down machine production, increased operating costs and caused tie-ups in processing. As these are all hidden losses that do not appear on the profit and loss statement, they often are overlooked in the same way hidden losses due to inadequate boiler-room equipment escape notice. After modernizing the electric circuits, the few plants where this had been done reported substantial reductions in insurance rates and greater safety for workers in addition to greater efficiency of electrical equipment.

### System Subdivided

In general, an electric system may be subdivided as: Source of energy, power generated within the plant or by a central station system; conductors of energy, wire and cable; protectors of energy, circuit breakers, fuses, lightning arresters, etc.; controllers of energy, panel boards, switchboards, switching devices, transformers, motor controls, etc.; consumers of energy, motors, processing units, lights, signals, fire alarms, etc.

In many plants contacted we heard complaints of high cost of electric current only to find after inspection that units under all of the foregoing subdivisions were faulty, antiquated or thrown together haphazardly. In some cases, the plants had been modernized with expensive electrical equipment but retained the old electric circuits "as is." Instead of saving money on such modernization, these plants were losing more than before as the new equipment increased the loading of already overloaded distributing circuits. As a result, electric current bills went up, much to the annoyance and surprise of the plant superintendents.

Wires and cables, helter-skeltering over roofs, hanging from trusses, walls and ceilings and running in all directions were common sights. In a few places cables on floors compelled workers to step over them, obviously a makeshift. In at least 70 per cent of the plants visited, the electrical systems were faulty or antiquated in one way or another.

In a competitive industry where selling prices cannot be geared too high, the plant management with the ability to keep costs down to minimum has the edge. That management can make attractive prices to buyers and still show reasonable profits. Electric power expense in many plants may run as high as four per cent of production costs, hence the horse-and-buggy electrical systems inspected on this survey mean not only bloated production costs but bloated selling costs too.

Maintenance men reported frequent breakdowns where the electrical systems were inadequate and often they took such disruptions too much as a matter of course. Breakdowns occurred so often that these men considered them unavoidable, a bad habit and costly to the plant. Sometimes these breakdowns are never reported because maintenance men overlook their importance in production costs or they fear that they will be censored for too many

"power off" reports when the systems are really to blame.

Too often we found men and machines idle waiting for repairs to be made. Disrupted production is another hidden loss which when added to excessive electric current expense may run costs up 50 per cent or more in some instances. Repairs and maintenance are high on these inefficient, outmoded electric systems.

In one plant, certain products were being made to order and had to meet definite delivery dates but defective cable splices in the electrical system broke down completely, delaying production so badly that part of the order was cancelled, entailing considerable loss.

### Steel Loss Heavy

We feel safe in stating that steel and metal working plants lose millions of dollars annually through visible and invisible losses due to inefficient and antiquated electrical systems.

An adequate electrical system can practically eliminate breakdowns and interruptions to production and will pay for itself in decreased maintenance and increased efficiency in little time. Many breakdowns are quickly adjusted and hence easily forgotten but added together over the year they total a substantial dollar loss.

Frequently, rejects are increased and the quality of a product decreased through electrical breakdowns. In more than one instance, breakdowns were reported of such serious nature that the scrapping of the crazy-quilt electric systems responsible and replacement with well-designed, modern systems would have been money in pocket. Even in such plants, the management still uses the same badly designed basic layouts with probably a few minor changes or additions here or there in the attempt to minimize "power off." Patchwork of this kind is only too apparent if one goes out to spot it.

Motor drives in many plants are overloaded or underloaded, a profit leak either way. Too often these deficiencies continue indefinitely because they are never checked against name-plate ratings on the electric device or with electric instruments obtainable for this purpose.

Frequent arcing of switches, loosening of screws, disadjustment and breakdown of mechanism, indicated that these important devices were old and expensive. One plant making spun-steel V-type pulleys discovered how expensive a little thing like a fuse can be, if inadequate.

An electric brazing furnace was originally fused with 600-ampere bare-link fuses. Workmen were adding links up to 750 amperes capacity and sometimes the fuses were burning out two or three daily. Fuses of modern design were purchased. From November to June, the same fuses were still on duty and going strong, not only reducing fuse expense but preventing costly delays.

In another plant where production was delayed three and four times weekly because of fuse outages, a new circuit breaker was installed. According to the management, it saves $60 weekly in time formerly lost. Many circuit breakers are so old and inadequate that they should be replaced.

One plant experienced a serious outage and loss to production because the circuit breaker, meant to be a safety valve, failed to function. The plant had grown in size since installation and the switchgear's rupturing capacity was no longer suitable. When old breakers fail because shortcircuit current increases to a point where it exceeds the rupturing capacity, damaged equipment, hazards to life and property as well as higher production costs are common occurrences.

Consider insulation when installing cable and wire. It is important and should fit requirements. Heat subjects a cable to deterioration; so do other factors such as solvents, acids, alkalies, moisture, sunlight, arcs or other forms of external heat. The insulation on wires and cables in many plants is deficient, causing breakdowns in production and expensive adjustments. Brittle, dried-out insulation was found in many plants visited. Old, dried-out insulation soon develops cracks and breaks away where vibration is usually great. That may mean a short circuit and consequent stoppage of production, or even a fire.

Maintenance men reported that wire had to be replaced frequently because of heat-rot, which indicated that they were using unsuitable insulation or that cables were overloaded. Where processing produces much heat, it is wise to use heat-proof, flameproof insulation. Where there is much oil, grease or corrosive fumes, insulated wire may be procured having high resistance against these factors. Low susceptibility to combustion and explosion are other advantages of modern insulation.

Sometimes large emergency overloads are necessary. Cable with high heat resisting characteristics is a wise investment here. Steam, dampness, dust and dirt, common to many plants, deteriorate wire and cable.

## Lifts Pigs by Their Ears

■ **Here a 3000-pound capacity truck equipped with special forks handles stacks of pig lead from freight cars to storage. Stacks are lifted by inserting forks under edge of stacked pigs and engaging ends of projecting ears as shown. This eliminates excessive fatigue to workmen incident to doing this work by hand and permits placing stacks close together. No pallets or stringers are needed and handling time is reduced. Photo courtesy Baker-Raulang Co., Cleveland**

It may cost more to install wiring with suitable resistance but it is a paying investment. Many plants should be rewired simply because the insulation is antiquated and inefficient.

Many plants and offices visited were below "see level" on lighting. During the past few years, lighting intensities have been stepped up considerably, existing wiring systems suitable for old intensity levels cannot carry the load necessary for modern intensities. If adequate lighting is to be installed in many plants we inspected, the circuits must be re-wired too.

The increase in lighting intensities has paced increased production in industry. Many plants visited are geared to faster production methods with more efficient machinery and tools but lack of adequate lighting is a drag on output, another profit leak not easily seen but there just the same. Vision must be faster for increased production. Shadows must be eliminated to clarify sight.

In one plant, tests showed that under shadowless lighting intensities, workers ordinarily classed as "slow" increased their working speed as much as 40 per cent, whereas workers with better eye-sight increased 15 to 30 per cent. Better lighting means more economical production, less spoilage, lower costs, fewer rejects, uniform standards, schedule maintenance, less eye strain on workers, consequently better morale, fewer accidents, greater accuracy, higher output and bigger net profits.

Certain maintenance men contacted doubted the ability of modernized lighting systems to increase intensities because of high bay areas but systems are obtainable that will take care of any plant height efficiently. In drafting rooms, offices and planning departments, adequate lights means fewer errors, fewer complaints from headaches and eye strain, more efficient work and lower costs. Whether hogging down huge forgings or micrometer machining, adequate light makes itself felt on the profit and loss statement.

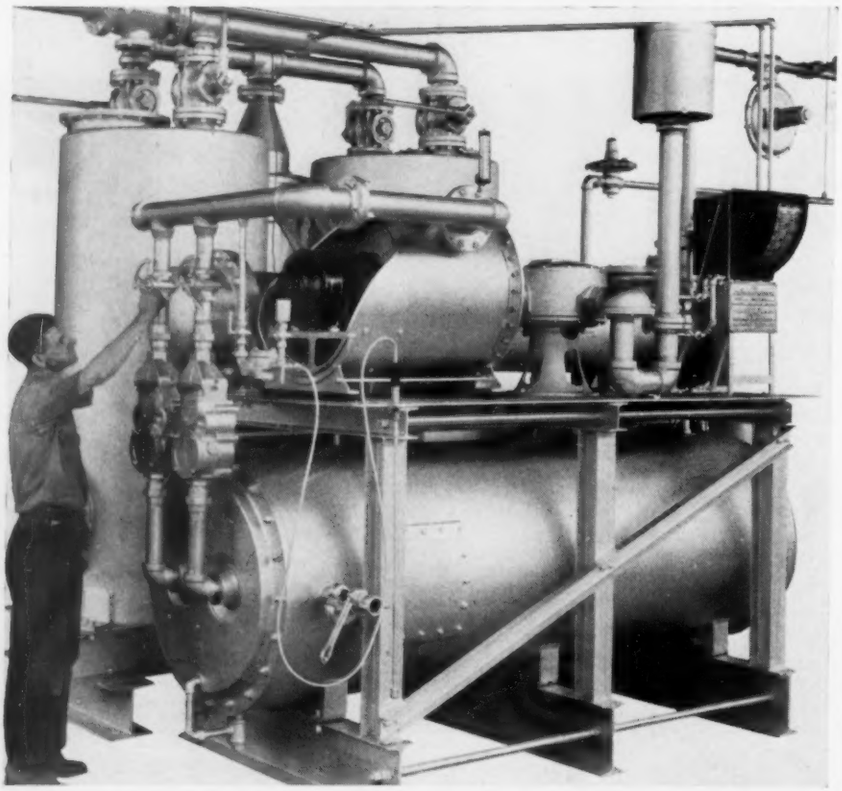
In re-designing an electric system, make provisions for future expansion. One reason why so many crack-pot electrical systems exist is that they were passable when installed years ago but plant size was increased and other conditions changed so the system grew without proper supervision or co-ordination. That type of system is a hodge-podge of wires, cables, switchboards, transformers with no regard to basic layout or unified operation. It is badly co-ordinated and a drain upon profits.

**Thorough Survey Important**

Before modernization, have a competent survey made. If the plant does not employ a competent electrical engineer, outside assistance should be obtained. Manufacturers of electrical materials will aid but since they make a variety of items and since the electrical system is a combination of so many different manufacturers' products, it is better to have an independent engineer co-ordinate the various units.

In the steel business, low production costs can follow only when the flow of work from first operation to the shipping room continues with minimum hold-up. That necessitates the aid of an adequate power and lighting system. The need for dependability is paramount in a steel mill; sheet mills particularly must keep on schedule. Shops with varied machining operations in various types of metal from straight carbon steel to the various alloys, from giant forgings to precision units, must maintain schedule and uniformity of product to keep abreast of an exacting market in this basic field. When the electric current plays possum for minutes or hours because the distribution system fails in any way, that means substantial monetary loss.

## Delivers Annealing Gas



■ **This atmos-gas producer, manufactured by C. M. Kemp Mfg. Co., Baltimore, delivers 8000 cubic feet of bright annealing gas per hour in a new Australian steel mill. Unit has automatic air-gas proportioning, indicating flow meters and activated alumina dryers**

## Plan Welding Course For Men in Industry

■ Following establishment of a new welding laboratory at Rensselaer Polytechnic institute, Troy, N. Y., the institute plans to offer soon a special course in welding engineering for men in industry.

This is to be an intensive four-week course, beginning November 2, and will be supplemented by an optional period of two weeks' experimental work. Time will be devoted to metallurgical theory, theory of welding and structural design. Laboratory experience will include heat treating, microscopic examination, welding, cutting and physical, magnetographic and radiographic testing.

Course is open to engineering graduates or to men whose responsibilities in industry have given them experience equivalent to an engineering course.

Communications with regard to the course should be addressed to Prof. Wendell F. Hess, department of metallurgical engineering, Rensselaer Polytechnic institute.

# The Art in annealing wire

## *how hot . . . how long . . . how often?*

21st in a series of advertisements designed to help you make a better selection of wire for maximum value per unit of cost.

*These microphotographs are all at the same magnification; therefore, structures shown are relative.*

**Almost any heating process will soften steel wire. The art of annealing is to produce the right degree of softness without sacrifice of other desirable properties. Temperature, duration, and frequency must be varied in accordance with the ultimate use of the wire . . . further drawing, upsetting or forming.**

**Annealing practice has become a science in the Wickwire Spencer mills. Thousands of case histories . . . records of time, temperature, physical tests and microscopic structures . . . have built up through many years positive guides for annealing Wissco Wire to predetermined characteristics. Users of Wissco Wire are thus assured of both proper structure and absolute uniformity.**

• • •

**WICKWIRE SPENCER STEEL COMPANY**

New York City, Buffalo, Chicago, Detroit, Worcester. Pacific Coast Headquarters: San Francisco. Warehouses: Los Angeles, Seattle, Portland. Export Sales Dept.: New York

Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes—for your specific purpose. Hard-Drawn, soft or annealed Basic or Bessemer Wires—Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wire—Valve Spring—Music—Clip—Pin—Hairpin—Hook and Eye—Broom—Stapling—Bookbinding—Dent Spacer Wire—Reed Wire—Clock—Pinion—Needle-Bar—Screw Stock—Armature Binding—Brush—Card—Florist—Mattress—Shaped—Rope—Welding. Flat Wire and Strip Steel, High or Low Carbon—Hard, annealed or tempered—Clock Spring Steel—Corrosion and Heat Resisting Wires. Consult the Wissco technical man on your wire problems, however large or small.

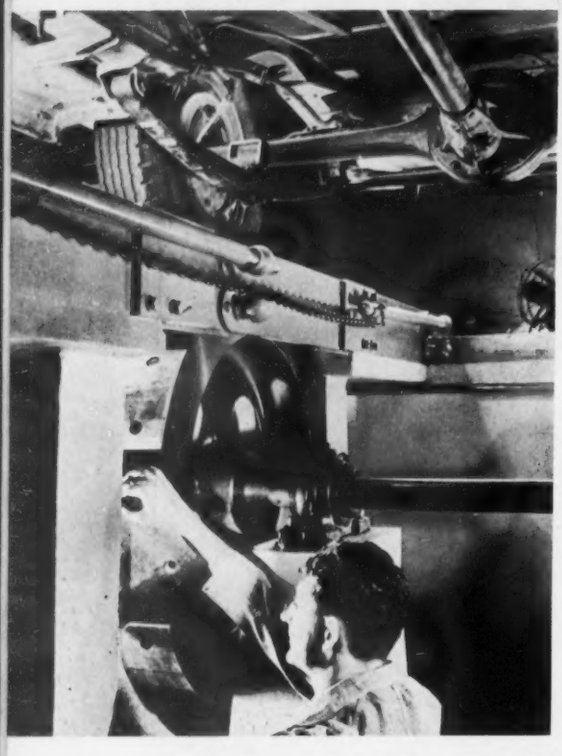
**WISSCO WIRE**
*by Wickwire Spencer*

# Auto Testing Laboratory Supplements Proving Ground

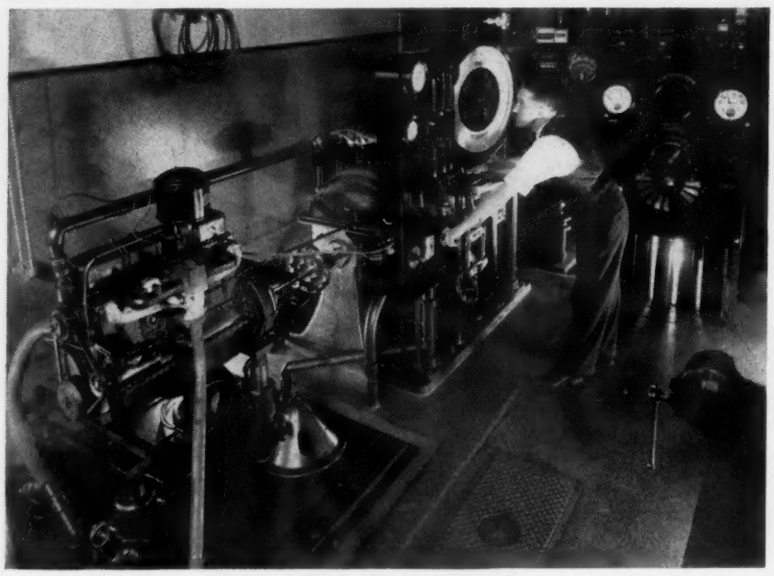
■ ALTHOUGH the proving ground is the starting point of actual road testing of automobiles, the laboratory provides facilities for accelerated tests on specific problems and yields data which can be submitted back to the proving ground for final proof.

Experimental engineering department of Chevrolet division of General Motors Corp., Detroit, has been supplemented by a recently completed test laboratory, several views of which are shown on this page. Seventeen rooms house various types of experimental and test equipment, including 11 dynamometers, ranging in capacity from 5 to 300 horsepower, a chassis rolls machine, four stroking machines, a clutch testing unit and a universal tension-compression device.

Stroking machines, used for fatigue and life tests, are mounted on a steel floor designed as a surface plate and weighing 28 tons. Rubber engine mounts, diaphragm clutch springs, third member assemblies and other chassis units are tested on these machines.



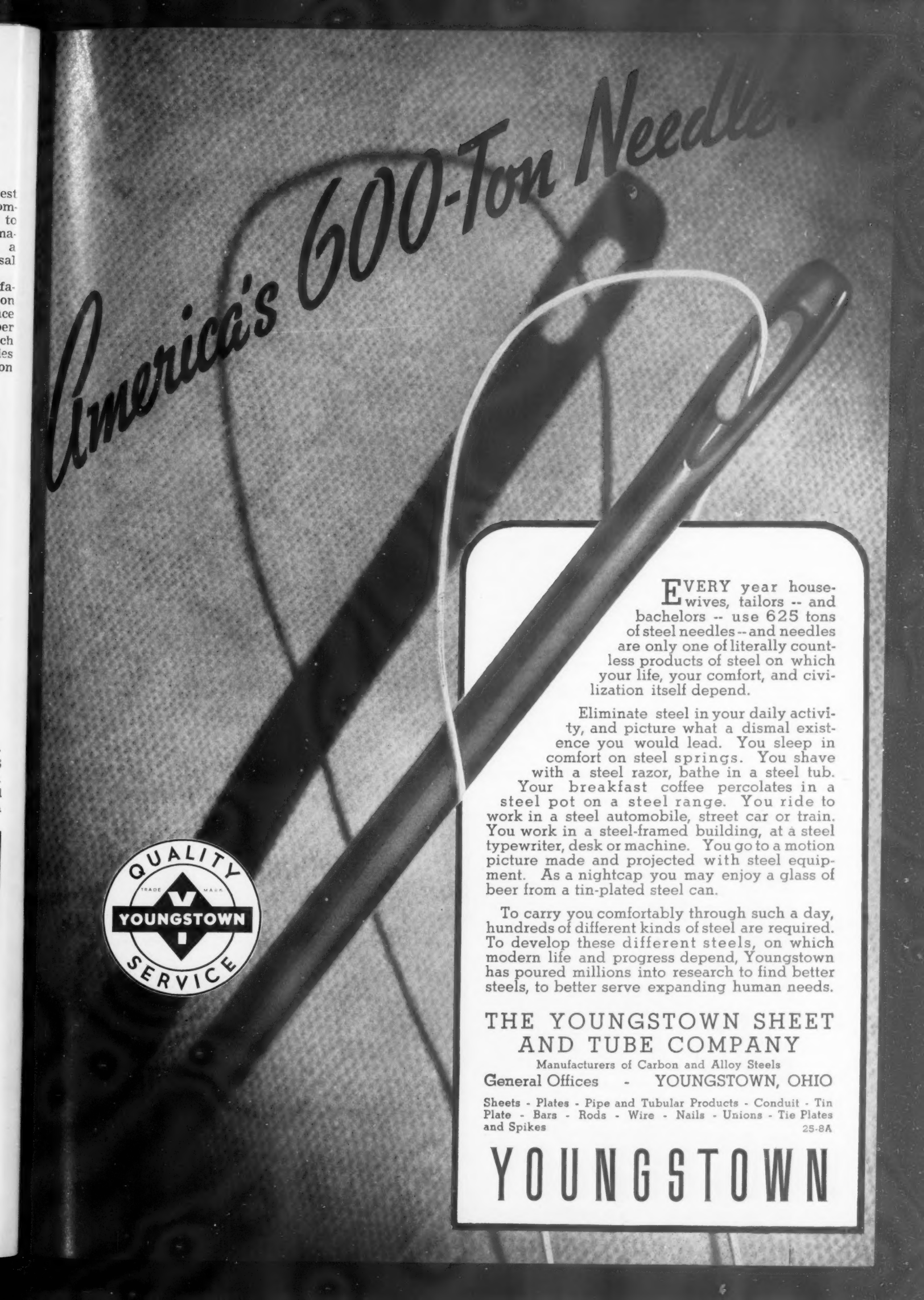
Engineer in pit of the chassis rolls room, attaching cleats to one of two heavy rolls which actuate wheels of test car. Varying sizes and positions of cleats permit simulation of different road conditions



At right is shown one of the seven dynamometer rooms in the new laboratory where factors of speed, power, load, fuel consumption and temperature may be controlled and measured

Below, carburetor tests are carried out in an air-conditioned room where temperature is held at 75 degrees Fahr. and relative humidity at 40 per cent. When test begins, hood with glass ports is lowered and lower edge fits into mercury seal, permitting evacuation

Above, ten alloy cast iron plates anchored to concrete piers provide a firm floor for this so-called stroking machine which applies intermittent loads on a complete axle and torque tube assembly. Force of machine is multiplied by the I-beam so that a total of 10,000 pounds dead load is being applied and released alternately 120 times per minute




EVERY year housewives, tailors -- and bachelors -- use 625 tons of steel needles -- and needles are only one of literally countless products of steel on which your life, your comfort, and civilization itself depend.

Eliminate steel in your daily activity, and picture what a dismal existence you would lead. You sleep in comfort on steel springs. You shave with a steel razor, bathe in a steel tub. Your breakfast coffee percolates in a steel pot on a steel range. You ride to work in a steel automobile, street car or train. You work in a steel-framed building, at a steel typewriter, desk or machine. You go to a motion picture made and projected with steel equipment. As a nightcap you may enjoy a glass of beer from a tin-plated steel can.

To carry you comfortably through such a day, hundreds of different kinds of steel are required. To develop these different steels, on which modern life and progress depend, Youngstown has poured millions into research to find better steels, to better serve expanding human needs.

QUALITY TRADE MARK YOUNGSTOWN SERVICE

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Manufacturers of Carbon and Alloy Steels

General Offices - YOUNGSTOWN, OHIO

Sheets - Plates - Pipe and Tubular Products - Conduit - Tin Plate - Bars - Rods - Wire - Nails - Unions - Tie Plates and Spikes

25-8A

# YOUNGSTOWN

# Spotwelding Aircraft

**Wide variety of work handled requires extremely flexible welding equipment. First part of this article, presented here, describes special setup built around one large unit**

Part I

**By C. L. HIBERT**
Consolidated Aircraft Corp.
San Diego, Cal.

■ THE AIRCRAFT industry has been criticized for attempting to spot weld aluminum alloy parts instead of using stainless steel because of the short plastic range and the low resistance offered by aluminum alloys. A first glance may indicate this is a just criticism except for several considerations. For present size of aircraft, aluminum alloy appears the best material that can be used because of light weight and high strength. Stainless steel may have the same weight to strength ratio, but the thin gages necessary to accomplish the same weight ship necessitate stiffeners and special design to prevent drumming and to present an aero-dynamic surface. In the full hard condition it is difficult to form.

A heat treatable stainless alloy might eliminate most objections to its use, but from a military standpoint it is out of the question due to small supply of chromium in this country in case of an emergency. However, stainless alloys are the ideal resistance-welding material because of their low carbon content, high electrical resistance and oxide free surface. If they are ever widely used, it may be safe to predict entire airplanes of spotwelded stainless steel construction.

Abstract from paper prepared for the American Welding society.

The spotweld department in an aircraft factory usually consists of one or two machines which are expected to weld the variety of furnishings in an airplane. These are worked out in small units, causing frequent change-overs and a lack of production methods.

Although copper alloys appear to be the best material for electrodes, they are not entirely satisfactory for spotwelding aluminum alloys as copper will alloy with aluminum easily, causing pickup and exterior splashing which necessitates redressing of the tips. Chromium offers good possibilities. Its conductivity is better than aluminum. It has a much higher melting point, is extremely hard and will not alloy readily. At present, it is not commercially available in a pure form that can be machined. Chromium plating is not satisfactory since conductivity and physical properties of chromium are destroyed in the plating process.

Improper care of electrodes appears the cause of more unsatisfac-

*(Please turn to Page 94)*

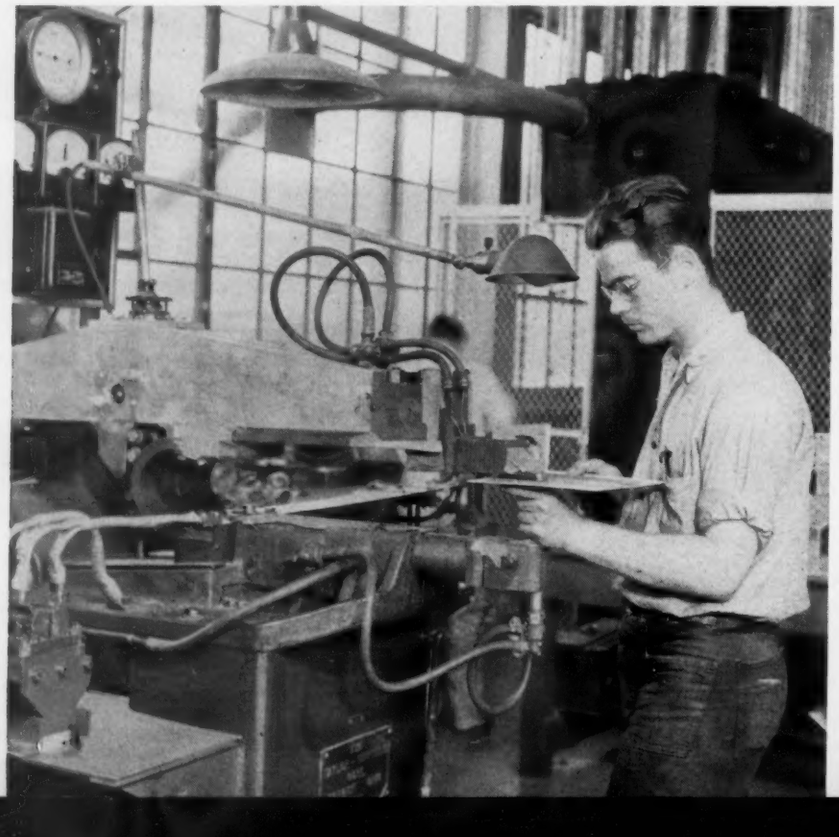
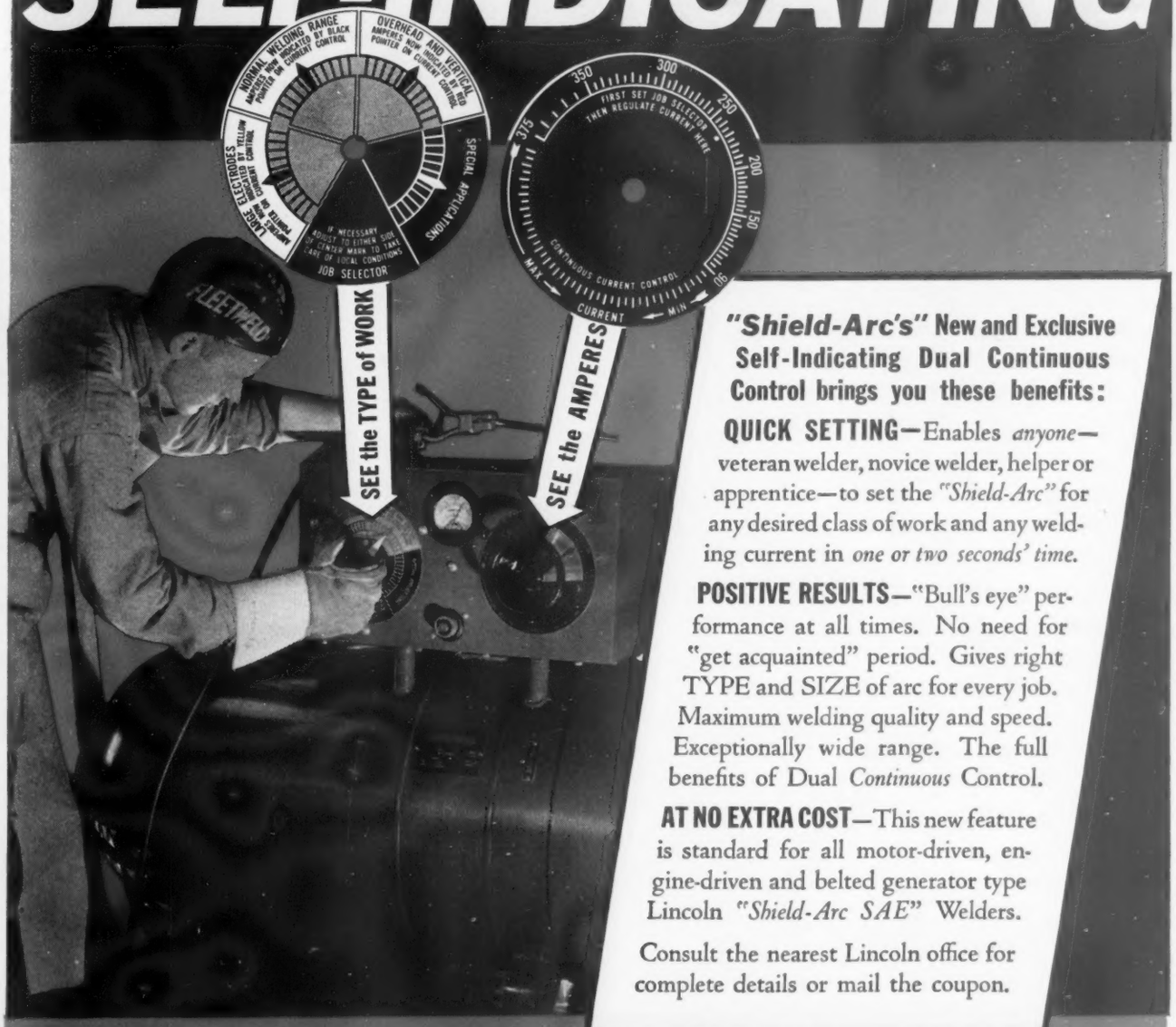


**Fig. 1—Spotwelder handling aluminum sheet, showing trunnion arrangement and water cooling of electrodes. Tool in upper arm has tool offset to the right. A small section of extension drill butt welder can be seen with leads attached to large welder**

# SELF-INDICATING


NORMAL WELDING RANGE
INDICATED BY BLACK POINTER ON CURRENT CONTROL
OVERHEAD AND VERTICAL
AMPERES NOW INDICATED BY RED POINTER ON CURRENT CONTROL
LARGE ELECTRODES
INDICATED BY YELLOW POINTER ON CURRENT CONTROL
SPECIAL APPLICATIONS
IF NECESSARY ADJUST TO EITHER SIDE OF CENTER MARK TO TAKE CARE OF LOCAL CONDITIONS
JOB SELECTOR
FIRST SET JOB SELECTOR THEN REGULATE CURRENT HERE
CONTINUOUS CURRENT CONTROL
MAX
CURRENT
MIN
SEE the TYPE of WORK
SEE the AMPERES
FLEETWED

**"Shield-Arc's" New and Exclusive Self-Indicating Dual Continuous Control brings you these benefits:**

**QUICK SETTING**—Enables *anyone*—veteran welder, novice welder, helper or apprentice—to set the *"Shield-Arc"* for any desired class of work and any welding current in *one or two seconds' time.*

**POSITIVE RESULTS**—"Bull's eye" performance at all times. No need for "get acquainted" period. Gives right TYPE and SIZE of arc for every job. Maximum welding quality and speed. Exceptionally wide range. The full benefits of Dual *Continuous* Control.

**AT NO EXTRA COST**—This new feature is standard for all motor-driven, engine-driven and belted generator type Lincoln *"Shield-Arc SAE"* Welders.

Consult the nearest Lincoln office for complete details or mail the coupon.

## COST-CUTTING FEATURES of this NEW LINCOLN WELDER

**DUAL CONTINUOUS CONTROL**—Gives any TYPE or SIZE of arc for faster welding, better results and wider range. Provides literally thousands of possible combinations of voltage and current.

**SELF-INDICATING SELECTORS**—Simplify setting of control for positive results every time.

**SELF-PROTECTED MOTOR**—Permits use of larger electrodes for 15% to 20% faster welding. Welder will not burn out.

**INDEPENDENT EXCITATION**—Steadies the arc at all times. Minimizes spatter.

**LAMINATED MAGNETIC CIRCUIT**—A costly construction that contributes to arc stability and welding range . . . . . ***and 25 other features.***

**See this new *"Shield-Arc"* in action at the National Metal Show.**

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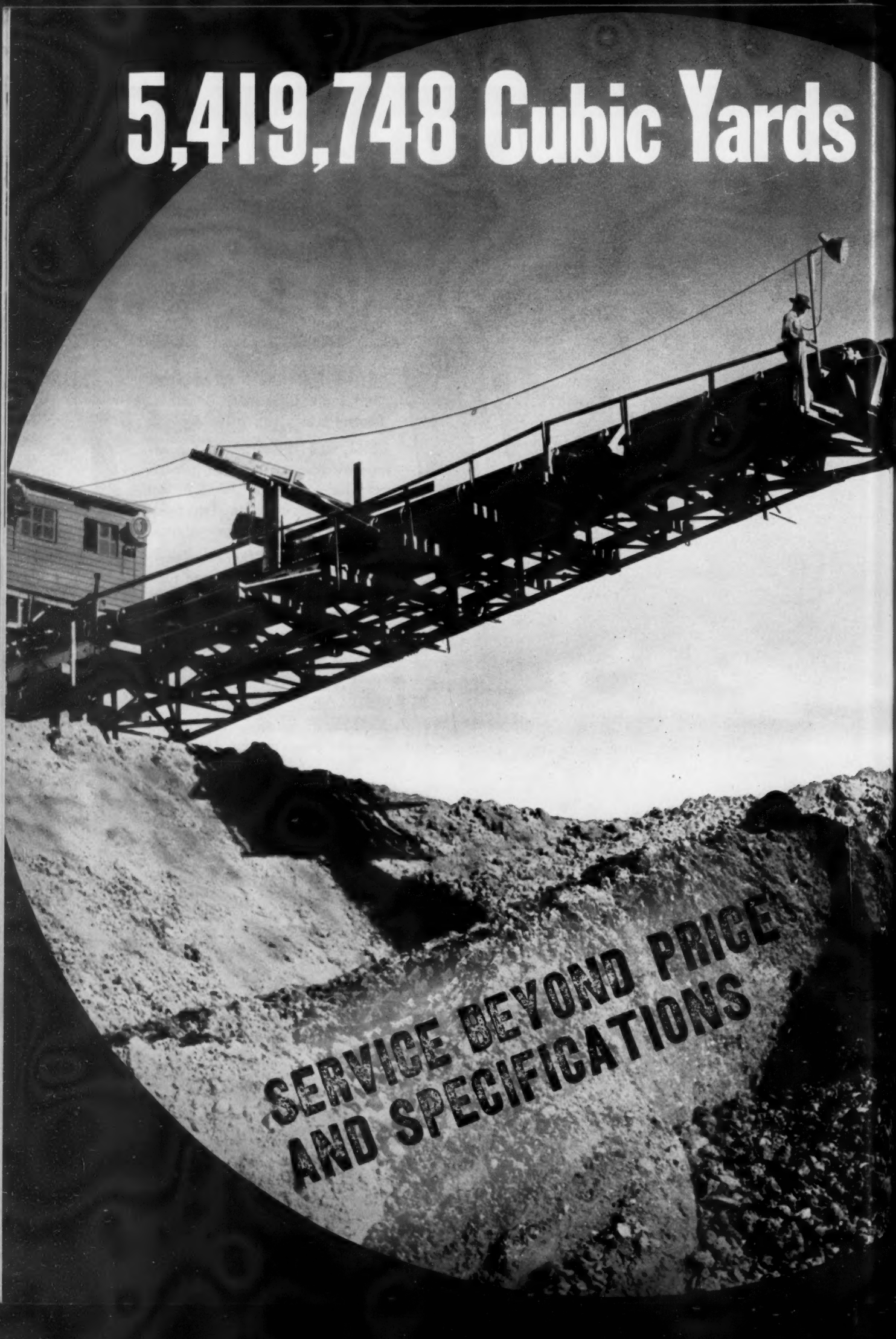
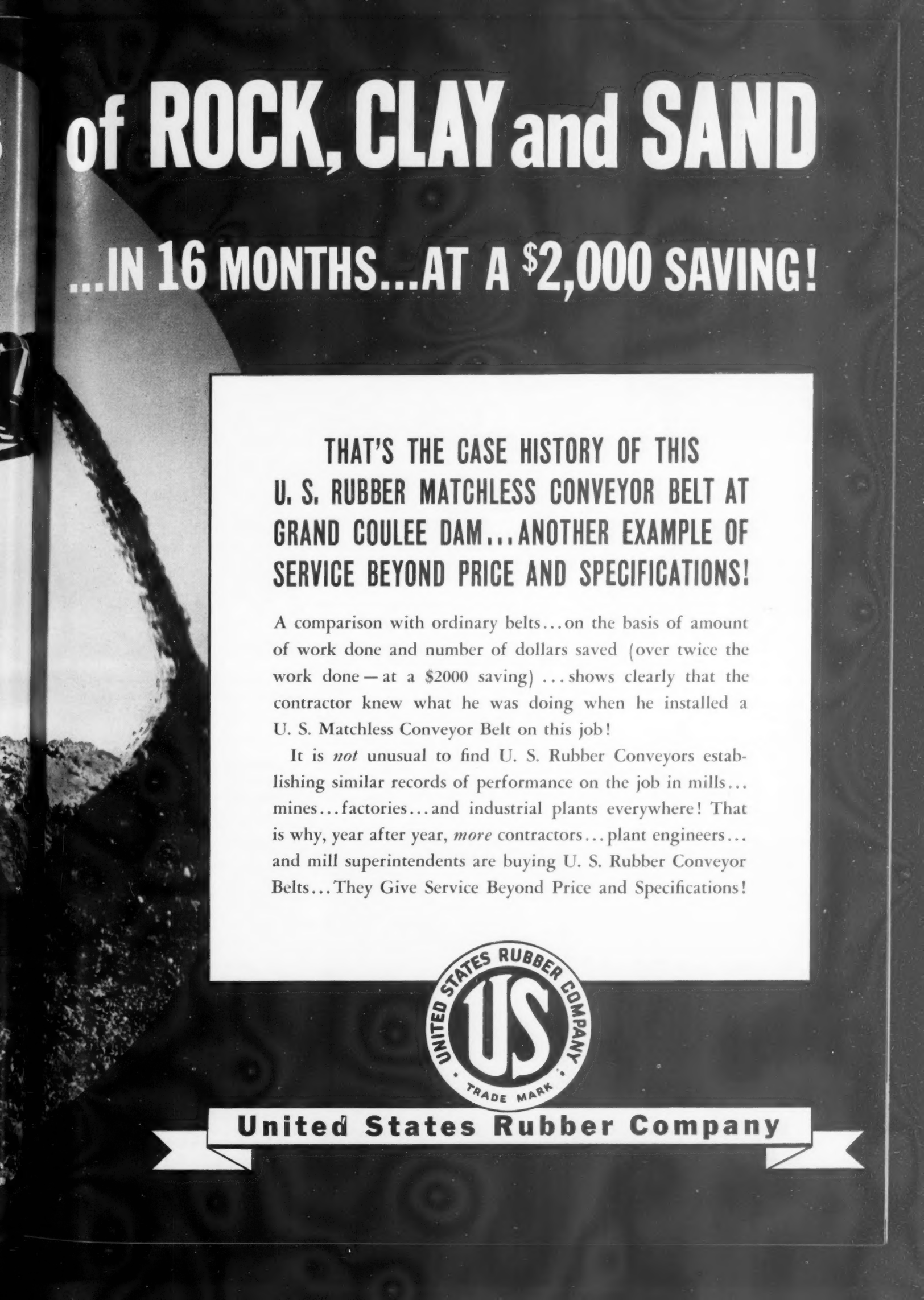

5,419,748 Cubic Yards
SERVICE BEYOND PRICE
AND SPECIFICATIONS



# of ROCK, CLAY and SAND

## ...IN 16 MONTHS...AT A $2,000 SAVING!

### THAT'S THE CASE HISTORY OF THIS U. S. RUBBER MATCHLESS CONVEYOR BELT AT GRAND COULEE DAM...ANOTHER EXAMPLE OF SERVICE BEYOND PRICE AND SPECIFICATIONS!

A comparison with ordinary belts...on the basis of amount of work done and number of dollars saved (over twice the work done—at a $2000 saving) ...shows clearly that the contractor knew what he was doing when he installed a U. S. Matchless Conveyor Belt on this job!

It is *not* unusual to find U. S. Rubber Conveyors establishing similar records of performance on the job in mills... mines...factories...and industrial plants everywhere! That is why, year after year, *more* contractors...plant engineers... and mill superintendents are buying U. S. Rubber Conveyor Belts...They Give Service Beyond Price and Specifications!

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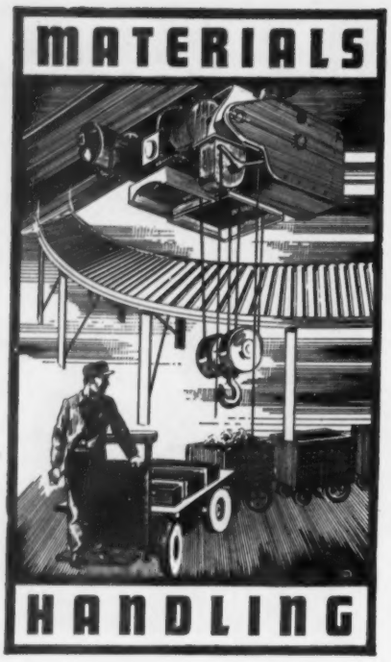
**United States Rubber Company**



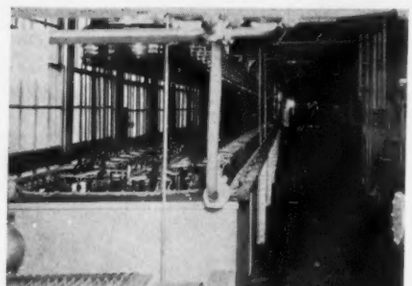

# Cash Registers

**High production requires elaborate mechanical handling system in finishing department. Chain conveyors and a 7000-gallon automatic plating unit are used**

■ TABULATING machines and cash registers are made in several hundred different types, styles, sizes and numbering arrangements to handle an almost endless variety of applications. Since operation of these machines involves thousands of intricate parts all of which must work perfectly, it is necessary to finish these parts to protect against corrosion and assure maximum life with good performance.

Also cases for equipment built by National Cash Register Co., Dayton, O., involve many different types of finishes, a large number of which are designed to match other office equipment. In these instances either samples of proposed finish are submitted by the company or the customer furnishes samples to be duplicated. One of the most popular types of case utilizes a chromium-plated finish to outline the front, back and end panels. Center portions of these panels then are finished in a black crinkle, the combination producing a modern appearing piece of equipment and a finish which withstands much abuse.

In forming these cases a problem arose in making the sharp corners desired where the crinkle-finish panel rises at the edge to meet the chromium plated trim which extends in towards the panel about ½-inch from the edge. By using dies shaped on the backside to partially cut the panel through in back of these corners it was possible to flow the metal on the outside surface to form a very sharp corner between chromium-plated edge strip and crinkle-finish panel. When finished, these panels appear as a piece of crinkle-finished steel with a chromium plated strip fastened on top of it around the edge.



**End view of automatic copper strike and nickel plating machine through which cabinets pass prior to chromium plating**

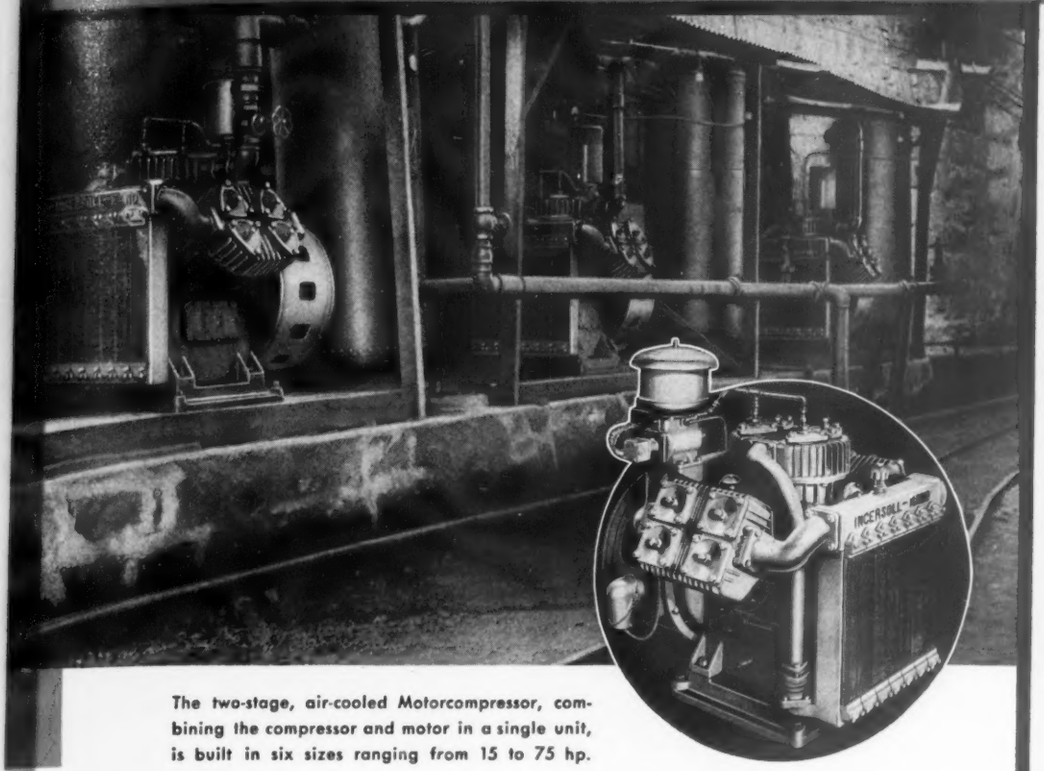
The procedure involved in obtaining the chromium plated finish makes use of elaborate production, cleaning and plating equipment and is as follows:

Cases come up on a chain conveyor to the polishing department where they are pickled and rough ground. Following this they receive a polish with 120 dry emery, 120 grease, 150 grease, 200 grease, finishing with a 200 color felt polish. Each polishing machine operator has two sets of wheels. While one

(*Please turn to Page* 104)

**Top, enameling ovens and conveyors with sanding benches where cabinets are sanded after baking and prior to graining. Below, loading and unloading station for the 7000-gallon automatic copper strike and nickel plating machine**

# Why they chose 7 MOTORCOMPRESSORS instead of



The two-stage, air-cooled Motorcompressor, combining the compressor and motor in a single unit, is built in six sizes ranging from 15 to 75 hp.

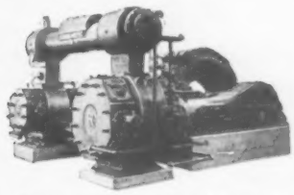
The photograph above shows three of the seven Motorcompressors and air receivers which were transported up the steep slopes of the Andes Mountains to furnish air for driving a tunnel on a hydro-electric construction job.

If the only requirement had been to compress the needed amount of air as economically as possible, the purchaser could have selected a single PRE Compressor. The Motorcompressor, however, was particularly adaptable to this job because:

- It is small, compact, light in weight for its capacity, and easily transported over rough country.
- Complete air cooling of cylinders and intercooler eliminates the need for water and water piping, and the danger of freezing.
- Two-stage operation assures full capacity at altitudes, low power cost and reliable performance.
- Radial cylinder construction and built-in motor eliminate foundations and simplify installation.
- The use of several smaller units provides for placing the air supply at the point of use and eliminates long pipe lines over rough terrane.

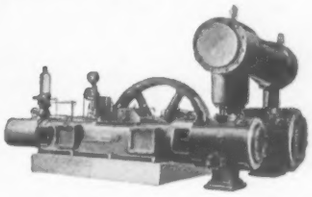
*Other I-R Products: Pumps, Condensers, Water-vapor Refrigerating Units, Diesel and Gas Engines, Hoists, Rock Drills and Pneumatic Tools.*

- **One Large PRE**



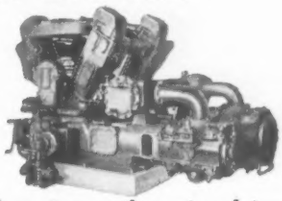
Two-stage, direct-connected electric-driven duplex.

- **One Large XPV**



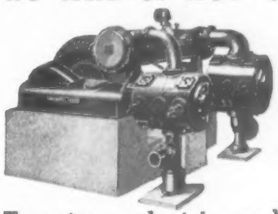
Two-stage, steam-driven, 4-corner.

- **Two XVO Units**



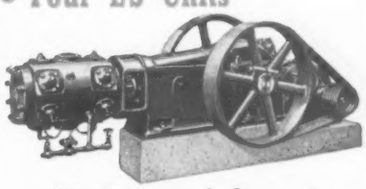
Two-stage, oil-engine driven, multi-cylinder.

- **Two XRE or XCB Units**



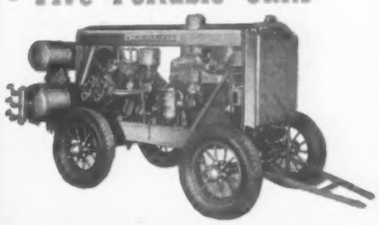
Two-stage, electric- or belt-driven, duplex.

- **Four ES Units**



Single-stage, belt- or steam-driven.

- **Five Portable Units**



Two-stage, air-cooled.

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665-1

# A. I. S. E. Papers and Discussions Cover Many Items of Interest

■ IN THIS and last week's issue of STEEL, abstracts are given of papers presented at the 34th annual convention of the Association of Iron and Steel Engineers, held in Cleveland, September 27, 28, 29, and 30, 1938. Also the points brought out by discussion after each paper are included.

The second paper, "Slabbing Mill Auxiliaries with Ward-Leonard Control," was read by W. B. Snyder, General Electric Co. It presented results of two years operation and a number of tests of Ward-Leonard control at Inland Steel Co.'s 46-inch slabbing mill. Used on side guards, screw downs, bloom shear, etc., all these drives were most satisfactory. The author pointed out that material on tables could be stopped and returned in two seconds against three or four with other equipment. This increased speed of operation at less stress on mechanical equipment and control permits higher output.

### Control More Flexible

These systems also allow mill motors to be operated at double voltage, permit more advantageous gear ratios and may even allow smaller motors to be used. This equipment has shown itself especially valuable in preventing breakage on preliminary runs of a new mill before the operating personnel is familiar with equipment.

Another important factor appears to be the reduced maintenance and repairs required. Records show costs of only 2.31 cents per ton on the 46-inch mill with Ward-Leonard control compared with 4.6 cents per ton for the 40-inch mill without this equipment.

Other savings include reduction in power. Comparative figures show costs of 1.77 kilowatt hours at a rate of 4 mills on the 46-inch mill with Ward-Leonard control against 2.4 kilowatt hours at rate of 6 mills for the 40-inch conventional mill. Total saving in maintenance and power totals about $26,000 per year at this plant. This particular installation also eliminated necessity of installing about $48,000 worth of additional motor-generator sets which of course influenced choice of this control on this job.

Conclusion of the authors was that the additional first cost of the Ward-Leonard equipment had been entirely justified by the operating results. A conservative estimate is that the additional cost will be returned in 2½ to three years.

Commenting on the paper, A. M. MacCutcheon, Reliance Electric & Engineering Co., pointed out that first costs in some particular installations were no higher for Ward-Leonard control than for any other, especially if all possible economies in the control are utilized. He also mentioned that combinations of Ward-Leonard control and field control are being effectively used to obtain speeds in ratios as high as 50 and 60 to 1.

Speaking of new installations, James Farrington, Wheeling Steel Corp., said that they were planning use of Ward-Leonard control on equipment to feed eight galvanizing pots on a contemplated expansion.

The paper, "Continuous Welding of Wide Strip Steel with Flash Welding," read by L. R. Milburn, Great Lakes Steel Corp., described layout and operation of three 96-inch wide continuous pickling lines at the Great Lakes Steel plant. This equipment incorporated a 60-cycle flash welder with plow type flash trimmer on the line described. Apparatus included coil conveyor upender, processor with coil opener squaring device, upcut shear, flash welder, flash trimmer, stitcher pinch roll, tables and guides.

All welder motions were electrically driven except the pull back on the moveable die which is electrically controlled, air operated. Welder successfully handles strip 96 inches wide and 0.125-inch thick. Minimum handled is 32 inches at 0.060-inch thickness.

Special lighting and a mirror are used to show underside of strip and to aid the operator in matching up the strip ends. Two water-cooled transformers are used to supply welding current but service conditions were such that water cooling was found unnecessary.

### Special Trimmer Built

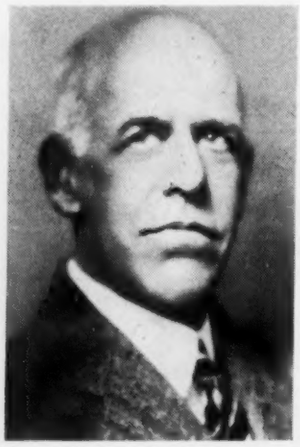
Since conventional trimmer units were too large for space here, a special trimmer was built. This was designed for use dry but works better with lubricant which is pumped to both top and bottom surfaces of the strip in front of the weld using a cutting fluid containing no oil. Trimmer uses a powerful motor to give a steady pull through the knives. All four edges of the knives are used in succession as they wear.

A 4000-ampere air circuit breaker is used with a 900-ampere (3600-ampere momentarily) 2-pole contactor between the circuit breaker and welder autotransformer. Two 5-inch aluminum channels take the current from these transformers through a tunnel to the welder autotransformers.

Control equipment is centered around two operating stands, one at the processor and one at the welder. In addition, push buttons on stitcher, processor, flash trimmer, etc. permit control at the unit.

Material is welded, goes through

John L. Young



Stephen Badlam

T. R. Rhea

M. J. Leding

pickler and is cold rolled and processed without having to cut out the welded joint. This has been made possible by providing a weld no harder than the parent metal. Trimmer knives have a clearance of only 0.066-inch between knives and strip. This means that weld is only 0.01 to 0.016-inch thicker than the strip after trimming.

This continuous pickling line turns out 550,000 to 600,000 pounds per 8-hour turn, with an average power consumption for welding of about 3.5 kilowatt hours per ton. Average current for strip 93 inches wide and 0.105-inch thick is 700 amperes with a push up peak of 1500 amperes.

Some difficulty was encountered in welding thin strip, such as 0.060-inch stock due to flexibility of the material making it difficult to hold at the gage head. Experience here indicates that among the necessary items are proper guides, correct speed and welding heat, careful alignment, clean sharp dies, and clean cut ends. Machine must be kept free from grounds, trimmer knives sharp, avoid trimming too close, test sample welds, and do not attempt full automatic control, added the author.

Sample welds tested 50,520 pounds per square inch on tensile tests.

In discussing this paper, H. W. Neblett, Inland Steel Co., said they had begun investigation of welding hot rolled strip steel in 1935 and in 1936 installed a flash welder on a continuous pickler line. He pointed

Newer equipment employs wider and heavier welding dies, he added, and there has been a change from hydraulic to electric cam drive. Also provisions now are made to remove flash from the die after each weld. New equipment is designed to remove the upset without reclamping into the trimmer. This permits trimming at a higher temperature and enables the surface trimmed to be less brittle.

Chairman of the welding session Tuesday, G. A. Hughes, Truscon Steel Co., said that although resistance welding was discovered by Dr. Thomson about 53 years ago, with arc welding soon after, it was not until 1917 that welding came into prominent use. At that time, it proved effective in repairing interned ships of foreign countries which had been damaged in the hope they could not be quickly reconditioned. As a result of the excellent showing made at that time, interest centered on welding with its resulting development.

First welding paper, "European Welding Practice and American Trends," by C. H. Jennings, Westinghouse Electric & Mfg. Co., brought out many interesting departures from familiar welding practice. Some plants are using welding 100 per cent, others are only thinking about it.

### European Equipment Limited

There is not the volume of production experienced in this country so this limits the use of high production equipment. It is almost impossible to standardize a design as each customer wants equipment built to his ideas and will not accept other designs. Thus a manufacturer will not build many identical units, most products being built around a basic design which is then modified endlessly to meet the customer's specifications.

Another factor is that raw materials are more costly and less available than in this country. This is seen in the wide use of structures made entirely of plates cut and welded, practically no standard shapes being employed.

Also labor is extremely cheap. This means that little mechanical handling equipment is used. Typical examples was on one job where three men were working, one receiving $2.50 per week, another $3.00, and the third $3.25.

Alternating current welders are very popular, in England about 60 per cent of all welding is done with alternating current. In Holland, about 80 per cent is alternating current, whereas in Germany only 20 per cent is A. C. In France and other countries, the welding is predominantly A. C.

With so much alternating current welding, use of coated electrodes is almost universal. In Germany, most of the electrode material is bare rod, the coated rod produced being used almost entirely in the producer's own plants. Since the German railways and Admiralty permit use of bare rod, most users follow this practice.

In America, bare rod was largely used until A.S.M.E. and United States Navy specifications called for coated rod. So began its use and the improved results soon caused its wide adoption here.

In France, washed or dipped electrode is quite popular. A special core type rod, with flux contained in the hollow core, is among the innovations here. It is seen to have some advantages for use in automatic equipment as it solves the contact problem.

In Germany, some work has been done with ingredients cast or drawn into the rod to obtain tensile strengths up to 70,000 pounds per square inch. In general, rod is designed for a particular type of work as is done here.

Welding machines themselves are similar to those used here but differ in appearance. There is a trend to development of special multiple operator sets. Typical of such equipment is a three-phase, alternating current unit which has 12 separate reactors for as many welding stations or operators. This operates from a three-phase power line.

Another unusual unit is a multiple-operator, direct-current outfit with only 40 volts on open circuit. As this is insufficient to strike an arc easily,

(*Please turn to Page* 107)

G. E. Stoltz

H. V. Flagg

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*announces*

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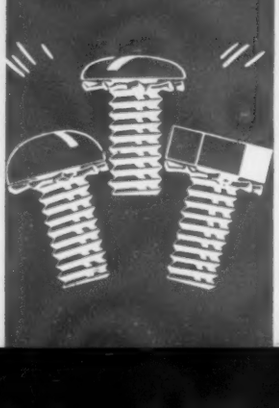
ASSURES CORRECT WASHER FOR EACH TYPE OF SCREW HEAD



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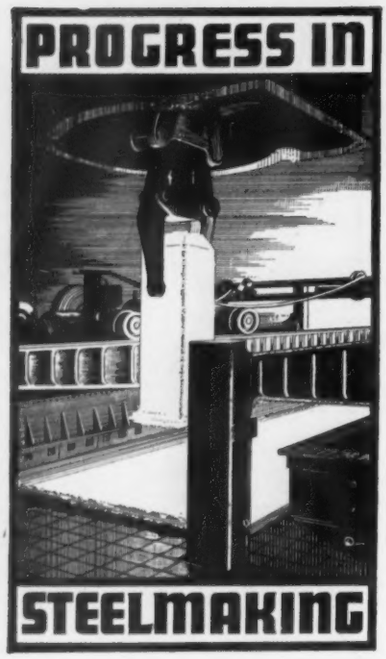



# Submerged Heat

**Newly perfected submerged gas burners, lighted and controlled automatically, produce notable economies in heating of pickling baths, provide strong agitation**

■ WITHIN recent years the Submerged Combustion Co. of America, Hammond, Ind., has developed a satisfactory and positive working, automatic, submerged combustion heating system. It is now being placed on the market after seven years' development has shown it to be entirely practical.

The system consists of a control assembly designed so the operator has only to press a starting button to put everything into operation. When shut down, the solution in the tank being heated completely fills the burner manifold and combustion chamber. When the starting button is pressed, a specially designed gas-and-air compressor is started up. As the compressed air is purging the burner of solution, the control system begins to operate. Automatically a hot wire igniter is heated to incandescence and a flow of pilot gas is admitted into the burner after a predetermined time and is ignited. To establish a uniform gas-air flow, the main gas flow first is permitted to pass through the system and then becomes ignited from the pilot. The burner might be classed as a nozzle-mixing type. There is no possibility of backfiring.

Burner plate is located about 4 or 5 inches beneath the solution level for cooling. It directs the flame through a tubular combustion chamber which conducts the products of combustion down to and across the tub bottom where the products of combustion may be vented and distributed to give the rate of agitation desired.

Following the ignition of the main gas flame the burner controls lock themselves into a running position until the desired solution temperature is reached. Thermostats actuating the control mechanism permit a constant flow of air through the solution, the flow of gas being turned on and off as heat requirements demand. This maintains a constant rate of agitation regardless of the solution temperature or rate of heat input.

The burner system is entirely automatic in operation. It controls the solution temperature as close as one-half of one degree when necessary. Usual pickling tub practice, however, is five degrees.

The combustion efficiency of the burner is high. The burner can be set to give any flue-gas analysis desired. To run an orsat test, it is necessary to place a length of quarter-inch pipe into one of the exhaust holes in the combustion chamber and conduct the products of combustion to the orsat. The general practice is to set the burner for about five per cent excess air.

Submerged combustion can be used to advantage in many applications of solution heating. It is particularly adaptable to rapid distillation and concentration of solution. It may be used to heat and agitate many types of cleaning solutions.

One of the most practical applica-

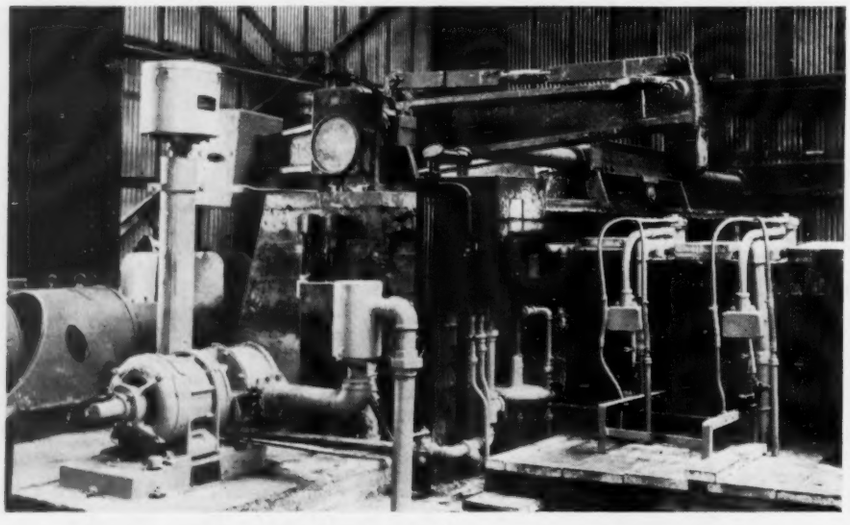
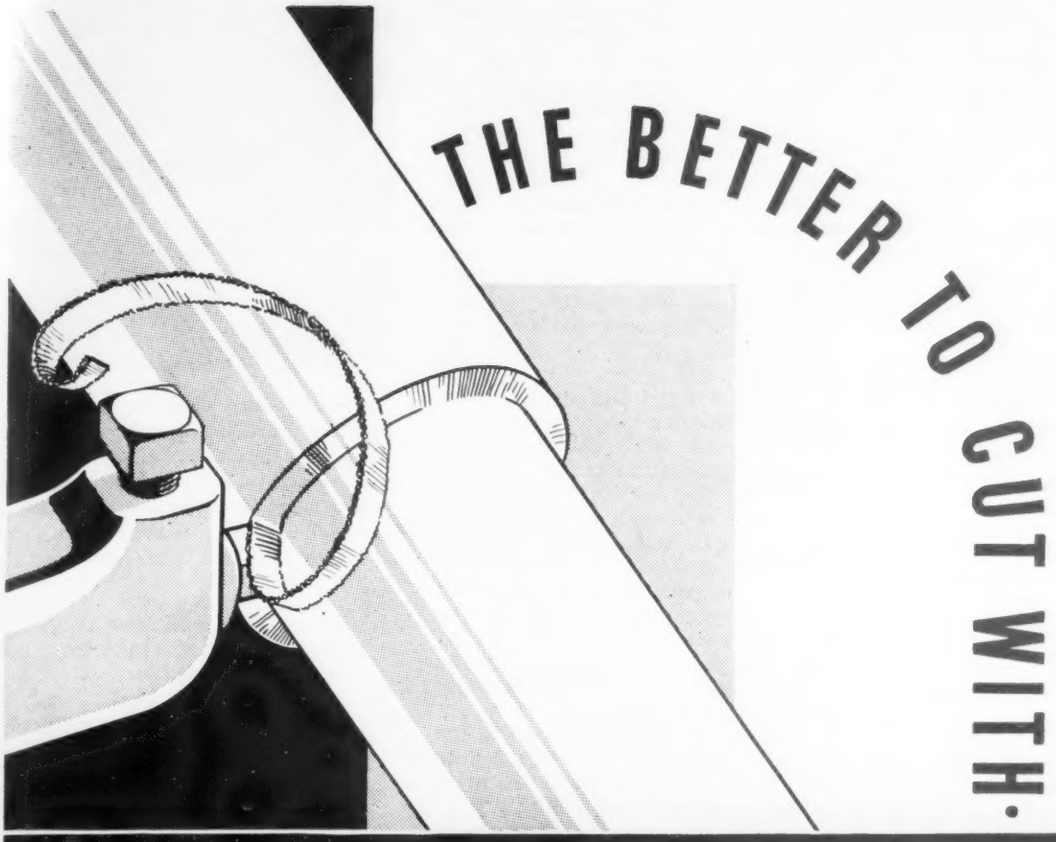


**Fig. 1—Rocker type sheet pickler in a large sheet mill in the Calumet steel region employs automatic submerged combustion burners as shown at left here. Foreground includes motor-driven air blower and control equipment for burners**



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LESCO

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## LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

tions for submerged combustion is the pickling of steel. The rate of scale removal from steel is in almost direct proportion to the rate of agitation. As in any bath, agitation may be accomplished either by moving the work within the solution or moving the solution about the work.

By use of the submerged combustion the pickling solution, generally sulphuric acid, is agitated and moved about the tank at a rate that would be extremely difficult to achieve mechanically. The agitation developed by a submerged combustion burner serves also to keep the temperature extremely uniform throughout practically any size tank. Actually, temperature differences are so small they cannot be measured.

Agitation produced by submerged combustion increases the production rate of a pickle tub. Average pickling time on various grades of steel will run from 30 to 60 per cent of former practice if the operating temperature of the tub with submerged combustion is the same as it was with steam. When it is desirable to operate the pickle tub at a lower temperature, the same rate of production obtained with 180 degrees Fahrenheit using steam can be produced with a 140 degree Fahrenheit temperature using submerged combustion.

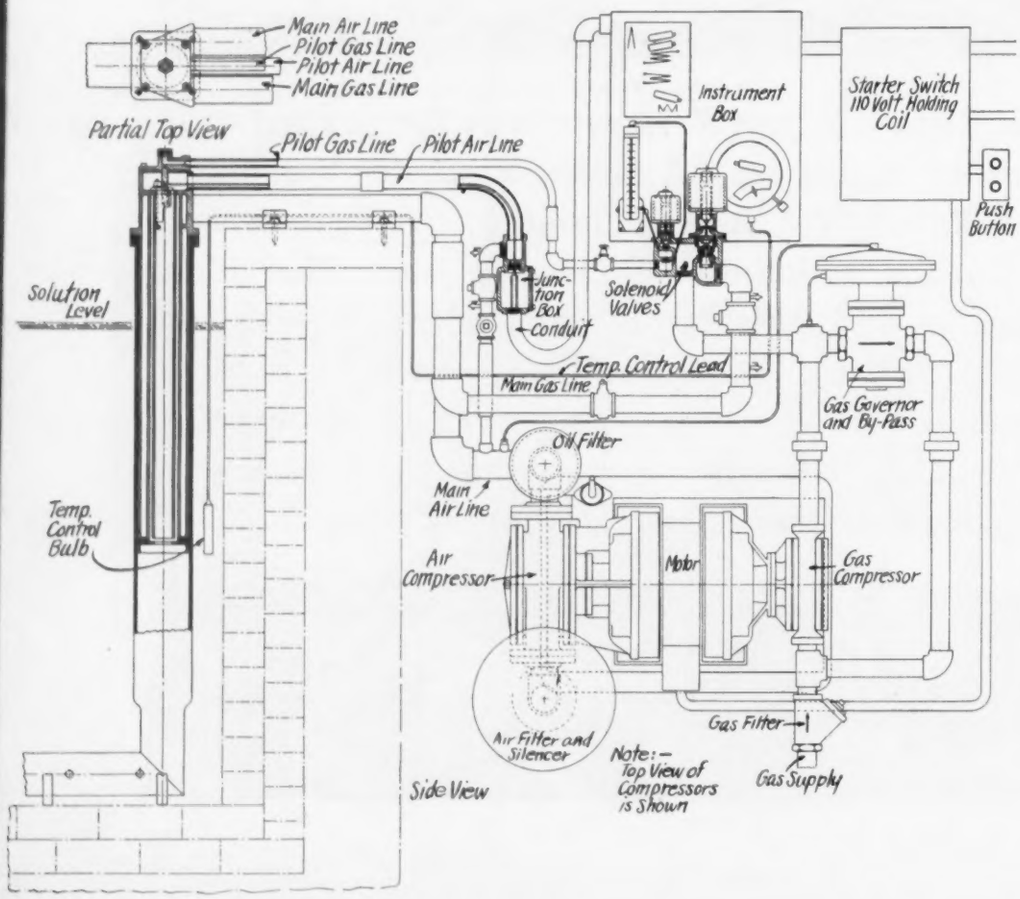
Submerged combustion is a development which extends back to 1887 when Brunler developed the first submerged combustion burner. This burner was ignited by hand and then lowered into the vat to be heated. When the vat had reached its desired temperature, the burner was turned off by hand. When heat was again needed in the vat, the burner was removed from the liquid, ignited and again submerged. The idea of a completely automatic submerged combustion burner was conceived by a man familiar with pickling practice in steel plants, with the realization that only the simplest form of control would be successful.

The Submerged Combustion Company of America has developed and patented an entirely automatic, submerged combustion burner. Unlike most experimental work, all development and test work has been done not in a laboratory but in a pickle room under actual working conditions. This system has completely automatic ignition controlled from a single switch so burners may be started and stopped by anyone completely ignorant of their workings; for example, a watchman.

Figure 2 is a cross section of the burner. Here can be seen the ignition point, pilot flame and the main flame along with the controls.

An air compressor and a gas compressor, driven by an electric motor,

**Fig. 2—Cross section and schematic diagram of the automatic submerged combustion burners, control, blowers, auxiliary piping, etc. System and equipment are patented**



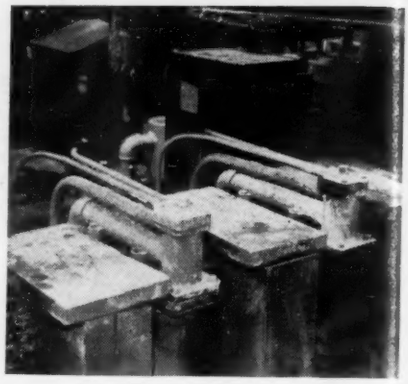



**Fig. 3—Closeup of submerged combustion burners in pickling tank with timbers alongside for mechanical protection. Steel is pickled here in one third the time formerly necessary when using open steam jets, it is said**

supply air and gas to the burner at a pressure sufficient to deliver the products of combustion against the head of liquid in the tank. The flow of gas is controlled by a governor to maintain the correct air-gas ratio. Ignition of the air-gas mixture is accomplished in three steps. First, a hot wire igniter is heated to incandescence by the passage of a high amperage, low voltage current. Second, a pilot jet is ignited by the hot wire. Third, the main flow of gas and air is ignited by the pilot jet.

In order to maintain a constant rate of agitation, the air delivered by the compressor is fed continuously through the burner and the liquid. Temperature of the bath is controlled by a thermostat. When the temperature is lower than desired, the thermostat turns on the gas supply and ignites it. When desired temperature is reached, the gas is shut off. In this way a constant rate of agitation and constant temperature are maintained.

The system is started and stopped by pressing buttons. Various operations in the ignition cycle and temperature control are handled automatically.

Burners are supplied in either single or double installations. A single installation consists of a compressor unit, burner and necessary apparatus for ignition and control. Each burner is rated at approximately 25 boiler horsepower.

In a double installation, two burners are connected to one compressor unit, the controls remaining essentially the same except that provision is made for additional ignition current and the gas and air controls are arranged so the flow of gas and air can be adjusted for each burner.

All the advantages of submerged

(*Please turn to Page* 103)

Advertisement

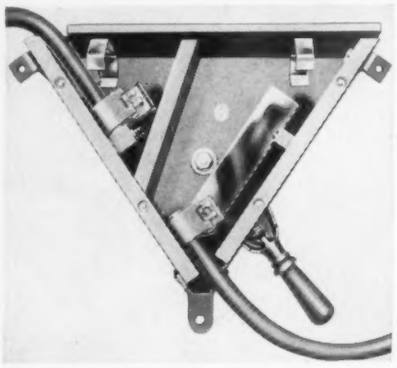
# COPPER ALLOY BULLETIN

*Reporting News and Technical Developments of Copper and Copper-Base Alloys*

OCTOBER "Bridgeport" BRASS CO. 1938

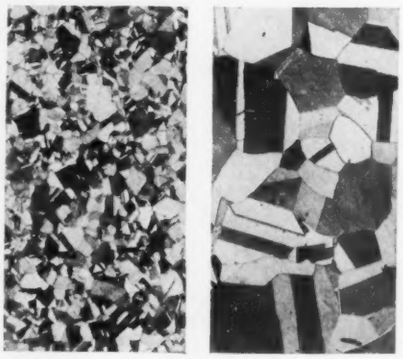
## NEW FEEDER SWITCHES USE COPPER AND BRONZE PARTS

New safety feeder switches, designed and built by Ohio Brass Co., Mansfield, Ohio, are furnished in ratings of 300 and 400 amperes, and are expected to fill the need for adequate switch installations of moderate capacities. Following the same general designs as the manufacturer's 600- and 1,500-ampere switches, the new devices are of the quick-make, quick-break type enclosed in a fireproof case. An important use of the new switches is in sectionalizing mine circuits or heavy-duty shop circuits. In this type of service the switches provide a safe means for disconnecting under load without damage.



The working parts, knife blade, and contacts of the switch are of pure copper stock. Terminals are cast bronze.

### Microstructures of Brass



LEFT: Fine grain structure helps to keep surface of finished article smooth. RIGHT: Coarse grain structure increases polishing costs. (Mag. 75X). See chart at right for annealing characteristics of yellow brass sheet.

## PROPER ANNEALING FACILITIES IMPORTANT TO THE MANUFACTURER OF BRASS GOODS

### Correct Procedure Will Increase Quality and Reduce Costs

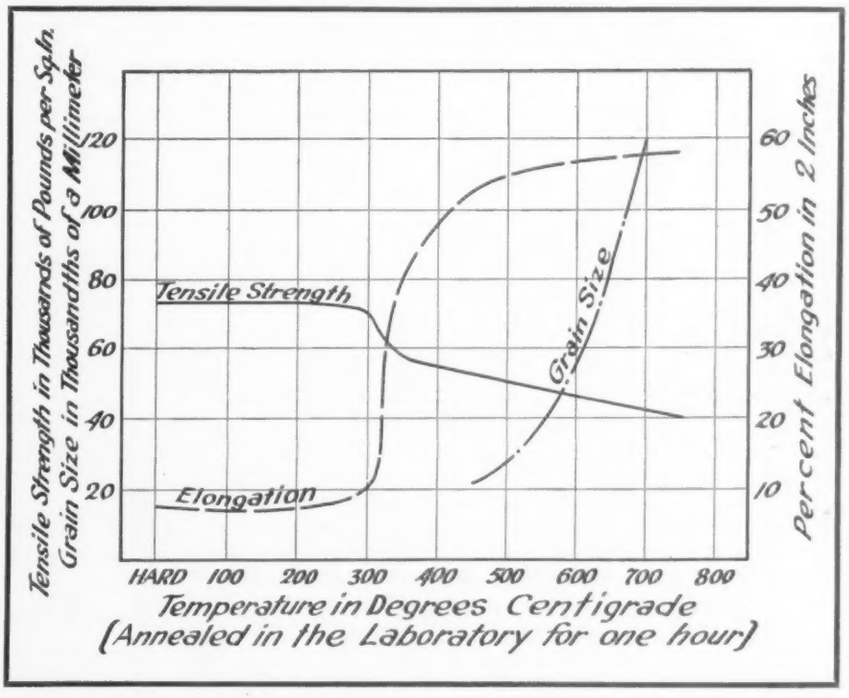
The manufacture of items from brass or other non-ferrous alloys often involves cold working the metal to such a degree that one or more annealing or softening operations must be carried out in the fabricator's own plant. If satisfactory results are to be obtained, these annealing operations must be performed with as much care as any of the other steps in the fabricating process. Adequate annealing furnaces and equipment for cleaning the metal in acid solution and thoroughly washing it are required. The fabricator also needs a good working knowledge of the annealing process.

Prior to the first step in the cold working process, the metal used by the fabricator possesses the characteristics resulting from processing at the supplier's mill. Here annealing is carried out under the strict supervision of the metallurgical laboratory, and the finished metal is supplied within close limits as to structure and physical properties, in order that the fabricator may use it with the greatest economy. Before shipment, samples of the metal are taken and laboratory tested to insure the correctness of all properties.

#### Need of Intermediate Anneal

As soon as the metal has been subjected to cold working, that is, forming, stamping, cupping or drawing, it hardens. If a considerable degree of cold working is involved, the metal becomes too hard to work satisfactorily, and under these circumstances the additional annealing in the fabricator's plant is necessary in order to complete the manufacturing process. Unless this anneal is properly performed, excessive product cost or poor quality may result.

*(Continued on following page, Column 2)*




These curves show the annealing characteristics of yellow brass sheet which were attained by testing samples of brass annealed in the laboratory for one hour. In actual practice, the temperature of the furnace may be about 50° C. higher than the temperature attained by the method.

# COPPER ALLOY BULLETIN

## NEW DEVELOPMENTS

**This column** lists items manufactured or developed by many different sources. Further information on any of these items may be obtained by writing the Bridgeport Brass Company, who will gladly refer readers to the manufacturer or other source.

---

**An automatic buffer,** according to the manufacturer, applies equal pressure on all critical surfaces. The machine requires 15 minutes or less to set up, and can be used for brass, steel, or plastics.

**A new lacquer** is reported to be especially suitable for protecting metal surfaces exposed to salt spray, such as small boat parts. It can be applied by brush over chromium, brass, bronze, or copper, and dries in 15 minutes. It is transparent, tough, elastic, and resistant to sunlight.

**A calculating rule** for determining the weight of flat steel lists conversion constants for copper, bronze, and other metals. Rule includes scales of thickness from .001 to 6 inches, width from ¼ to 96 inches, and length from ⅜ inch to 1 foot in inches and parts of an inch and from 1 to 1,000 feet in feet and parts of a foot.

**Cutting lubricants** for non-ferrous metals are said to be non-corrosive and non-tarnishing. They consist of sulphurized oils in which the sulphur is permanently incorporated in the body of the oil and will not separate out. Lubricants will not gum or form deposits on machine-tool parts.

**Anode bags** of glass cloth are reported to aid in obtaining the smoothness of nickel plate required when a chromium finish is to be applied. Bags are of one-piece tubular construction, sealed at one end by a special process, and can be used for all acid solutions and for many alkaline solutions.

**Threading and tapping operations** can be performed simultaneously with a new tool, even when the thread pitches are different. The tool, which can be used on chucking machines, turret lathes, and automatic machines, eliminates rechucking the work. Essentially, the tool consists of an adjustable die-head combined with a compensating tap-holder. Correct pressure for starting the external threading operation is supplied by the tool-holder, after which the die-head floats on its own lead, independently of the tap.

**Melting furnaces** for brass and bronze are made in three sizes for tilting and two sizes for stationary design. Units are gas-fired; burners are arranged for equal heat distribution.

**A pipe vise stand** is equipped with power unit and check to permit threading, cutting, and reaming of all sizes of pipe up to 2 inches. Pipe is gripped in a bar-operated scroll-type chuck and revolved by the power unit. Chuck speed can be varied from 14 to 32 RPM. Motor is operated from 110-volt supply.

## PROPER ANNEALING

*(Continued from preceding page, column 3)*

This intermediate anneal is as important to the fabricator as the original mill anneal. If the fabricator's annealing furnace has inadequate capacity for his requirements, he is forced to increase the temperature at which he operates his equipment, and must reduce the annealing time to a short period. Under these conditions a uniform anneal is almost impossible. While parts of the charge may be correctly annealed, others may be insufficiently softened, and difficulty will be experienced on subsequent cold working operations. Other parts of the charge may even be over-annealed, giving rise to too large a grain structure. The finished article will then have a rough surface and may even develop small checks.

### Over-Anneal Raises Costs

Bright dipping will often reveal over-annealing, as the metal takes on a matte lustre. Forming or stamping metal that has a coarse grain structure stretches it locally and causes the surface to become rough. An excessive amount of buffing and polishing is then required. Not only do finishing costs rise, but poor quality results. When such material is plated, an inferior plate is deposited because the grain structure of the metal influences the structure of the plate deposited on it.

### Securing the Correct Anneal

The annealing process should therefore be carefully controlled to produce a temper which best meets the requirements of both cold working and finishing. If possible the grain structure should be kept as fine as possible without leaving the metal too hard for the necessary cold working operations which follow. The proper grain structure will do much to keep the finishing costs down and will at the same time improve the quality.

Fabricators who have annealing problems can avail themselves of the experience of Bridgeport's laboratories. Suggestions and advice will enable the fabricator to produce his articles with the greatest ease and lowest cost consistent with product quality. Bridgeport's wealth of research and experience can often save much time and expense for users of brass mill products.

## BRASS TERMINOLOGY

*This is the seventeenth of a series on the nomenclature peculiar to the industry specializing in the making of brass, bronze and copper alloys.*

---

In the case of sheet and strip there are several terms descriptive of operations performed on the metal after the rolling process. In some cases these operations are part of the normal manufacturing process; in other instances they are intended to produce metal with special characteristics.

**Slitting** applies to the process of cutting wider metal into narrower strips by passing it through rotating circular shears, which cut it to the finished width. This process is customary in the production of widths too narrow to be economically rolled.

**Shearing** indicates the process of trimming the edges of metal on a straight shear, and is usually applied to sheet rather than strip. The term is also used to differentiate metal cut with a shear from that trimmed with a saw.

**Sawing** designates trimming the edges by a saw. The process is used for flat sheets or bars, generally too thick to be sheared without breaking or distorting the edge.

### Special Operations

The terms **flattening, patent leveling,** and **resquaring** apply to processes used when fabricating requirements demand absolutely flat surfaces or square edges. The additional manufacturing expense involved increases the price of the metal and these processes should therefore not be specified unless necessary.

**Flattening** is a process by which the metal is passed through special straightening rolls which flatten it without effecting any change in the gage.

**Patent leveling** is really a special type of flattening. In this process the metal is straightened and flattened by stretching it in a machine which is specially designed for the purpose. This term is usually applied to sheet.

**Resquaring,** as the name indicates, denotes a process for squaring the edges of the metal with respect to each other after the rolling operation. This term also applies to sheet. In the resquaring process the metal is cut on a straight shear so that each of the corners of the sheet forms an angle of 90 degrees.

**Camber,** applying to sheet, rolls, and narrow strip, designates the departure from edge straightness.


## PRODUCTS OF THE BRIDGEPORT BRASS COMPANY

*Executive Offices: BRIDGEPORT, CONN.—Branch Offices and Warehouses in Principal Cities*

**SHEETS, ROLLS, STRIPS**—*Brass, bronze, copper, Duronze,** for stamping, deep drawing, forming and spinning.

**CONDENSER, HEAT EXCHANGER, SUGAR TUBES**—For steam surface condensers, heat exchangers; oil refineries, and process industries.

**PHONO-ELECTRIC* ALLOYS**—High-strength bronze trolley, messenger wire and cable.

**WELDING ROD**—For repairing cast iron and steel, fabricating silicon bronze tanks.

**LEDRITE* ROD**—For making automatic screw machine products.

"Bridgeport" BRASS CO. *Established 1865*

**COPPER WATER TUBE AND FITTINGS**—For plumbing, heating, underground piping.

**DURONZE ALLOYS**—High-strength silicon bronzes for corrosion-resistant connectors, marine hardware; *hot rolled sheets* for tanks, boilers, heaters, flues, ducts, flashings.

**BRASS, BRONZE, DURONZE WIRE**—For cap and machine screws, wood screws, rivets, bolts, nuts.

**FABRICATING SERVICE DEPT.**—Engineering staff, special equipment for making parts or complete items.

**BRASS AND COPPER PIPE**—"Plumrite"* for plumbing, underground and industrial services.

*Trade-name.

# BRIDGEPORT BRASS

# Microscope Instrument Is New Aid In Aligning Grinding Machine Beds

By KARL KECK
Cincinnati Grinders Inc.
Cincinnati

■ MANY finished ground parts such as rolling mill rolls, mill pinion bearing journals, machine tool spindles, long shafts, and the like, must be absolutely accurate, with no measurable variation in straightness. This degree of accuracy can be obtained only when the grinding machine table on which the parts are produced travels in a perfectly straight line.

Two factors, other conditions being equal, determine the period of time during which a high degree of accuracy may be obtained on long center-type grinders. First, the bed and principal castings must consist of a metal which solidifies without appreciable internal strain and which does not change in surface alignment after machining. Second, the parts must be machined and assembled with a high degree of precision.

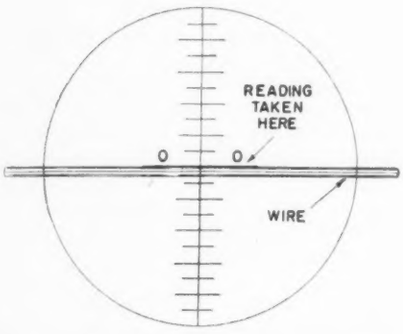



**Fig. 1—A line bisecting the optical field of the microscope is graduated in one-half thousandths. Readings are taken from one side of the wire**

Center-type grinding machines manufactured by Cincinnati Grinders Inc. have their beds and principal elements cast from Meehanite metal, an iron which provides a high degree of permanency against deflections due to internal stresses. All parts are machined and assembled by skilled craftsmen working with modern equipment. The result is maximum transmittable accuracy which easily meets commercial requirements.

If a machine conforming to the foregoing requirements could be placed on a stable foundation which never changed, new-machine accuracy would be retained indefinitely. However, conditions beyond control tend to destroy level and alignments of long center-type grinders after they are installed in the plant of the purchaser.

It is extremely important, therefore, that the machine be realigned and releveled periodically just as faithfully as any other periodic service job is performed. How often rechecking should be undertaken depends entirely upon the foundation under the machine. The operation is not particularly difficult, and it is the only assurance that a high degree of accuracy can be obtained.

Fig. 2 shows a new microscope aligning instrument which Cincinnati Grinders Inc. has designed specifically for aligning the long beds of its grinding machines. The device has a cast-iron platen with a vee bearing and a flat bearing, duplicating the table bearing surfaces which contact the bed, thus obviously the instrument will be guided over the same path as the machine table.

Mounted on the platen is a microscope having an accurately divided scale across the optical field. This scale, graduated in thousandths and shown in Fig. 1, indicates the deviation of the guiding vee-way from a straight line when readings are taken at regular intervals and on the same side of the line. A piece of steel music wire stretched tightly from one end of the bed to the other establishes the straight line for taking readings.

Intervals of 2 feet are recommended for taking readings. White paper placed under the wire at these intervals and a shielded light bulb on an extension cord aid visibility greatly. To avoid the possibility of error being introduced by the wire, it is best practice to use a new wire for each test.

Incidentally, accuracy of level of the ways in a horizontal plane should be checked before alignment is tested. A micrometer level can be placed on the machined top surface of the platen, or a long level extending across the bed from the vee to the flat way can be employed. Only precision type levels should be used.

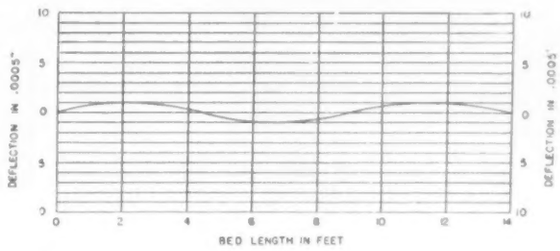



**Fig. 3—How a bed may vary before it is aligned for straight-line table travel is shown in this graph**

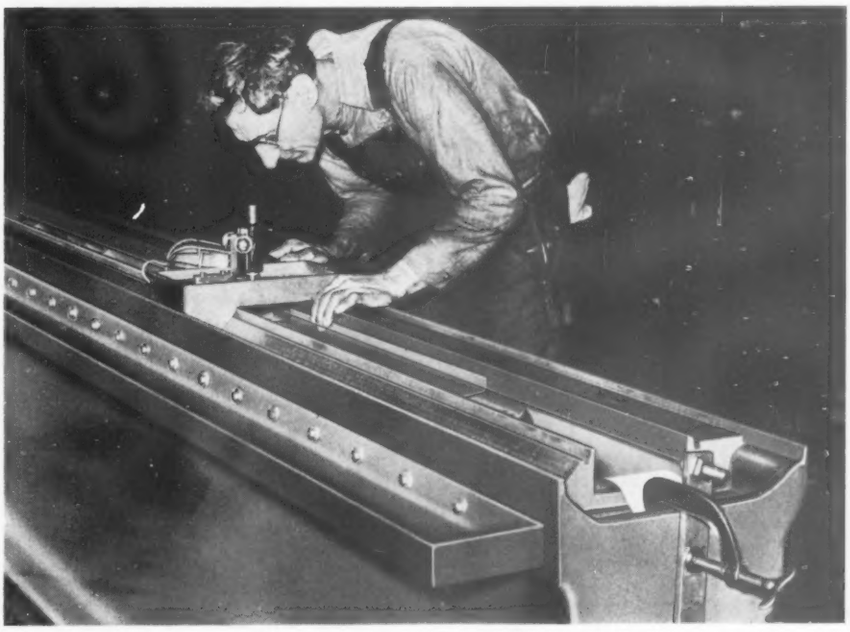
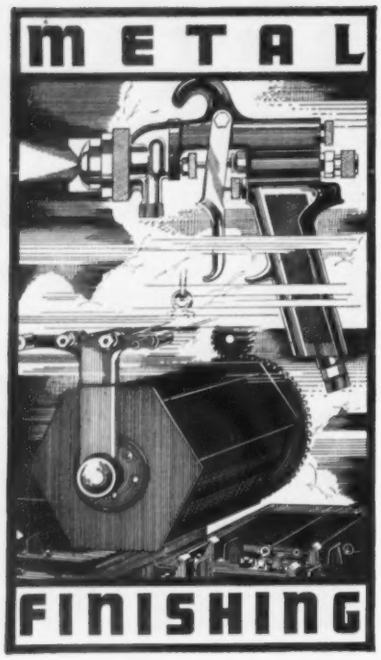


**Fig. 2—This new microscope instrument makes aligning long center-type grinding machine beds a precision operation**




# Galvanizing Problems

**Adherence improved by coating newly rolled or drawn surfaces, with minimum pickling, thorough washing, zinc chloride flux, and minimum immersion. Cadmium embrittles zinc**

By W. M. PEIRCE
Research Division
New Jersey Zinc Co.
Palmerton, Pa.

■ ADHERENCE of a zinc coating on steel is influenced by character of iron-zinc alloy layer or layers which form during hot dip galvanizing and, second, by ductility or toughness of outer zinc layer. This zinc layer is essentially a cast structure and so has none of the ductility conferred by mechanical working.

Character of alloy layer is dependent most of all on composition of the steel base and physical condition of steel surface; that is, whether the surface is rough or smooth, or whether there is a coating of sponge iron remaining upon it from the pickling operation. On steel of any composition, the alloy layer may be reduced to a comparatively thin and dense appearing band if the steel surface is clean and smooth when it enters the zinc bath. This may be brought about, for example, by galvanizing promptly after rolling so only a minimum of pickling is required and accompanying this by effectively washing the steel to remove any iron salts or sponge iron.

This washing becomes simple if the pickling time is very short. Not only is less alloy formed but boundary between alloy layer and zinc coating approaches a straight line instead of being very irregular with jagged points of alloy notching the underside of the zinc coating and affording starting points for cracks when the coating is bent.

A second factor is time of immersion in the galvanizing bath. Temperature is only a minor factor. Time of immersion can be made extremely short if iron salts from pickling are removed by washing and if the steel is fluxed with 25 per cent zinc chloride instead of hydrochloric acid. This eliminates necessity for converting the iron chloride to metallic iron which forms dross and zinc chloride, the latter then acting as a flux—all of this absorbing heat and taking time to say nothing of producing unnecessary dross. This is the rather simple theory back of the known fact that adherence of zinc coatings can be greatly improved by galvanizing a freshly rolled or drawn steel surface, with a minimum of pickling, thorough washing, zinc chloride flux, and a minimum time of immersion in the galvanizing bath.

As to effect of zinc composition, it may be stated that with one or two exceptions this has little, if any, influence on the thickness or character of the alloy layer. It does, however, have a great influence on ductility and toughness of the zinc layer, previously mentioned as the second factor determining the adherence of a zinc coating.

### Causes Brittleness

Briefly, cadmium, virtually absent in high purity zinc, has a strong embrittling effect on a cast zinc structure and is present in sufficient quantity in other grades of zinc greatly to increase the tendency of the zinc layer to crack when bent. This is why high purity zinc is used extensively in galvanizing wire which must have heavy adherent coatings. On the other hand, there are elements which, when added to pure zinc, increase ductility either by going into solid solution or through grain refinement. A way to take advantage of such alloying elements may be found some day.

There is an important number of cases where steel is used and where conditions are so corrosive that the protection afforded even by heavy galvanizing is not all that is desired. Frequently in such cases a question arises as to whether the galvanizing should be painted immediately or whether painting should be done after the zinc coating is partly weathered away. There is danger of allowing corrosion to proceed too far before painting and it

Abstract from address delivered at twentieth annual meeting, American Zinc Institute Inc., So. Louis.

## Stainless Reels Used

■ **Take-up reels of IngAclad 18-8 stainless steel have eliminated rust spots in finishing sash cord. Reels were fabricated by Mossberg Pressed Steel Corp., Attleboro, Mass.**

is becoming more common to avoid this danger by painting the galvanized steel at the outset.

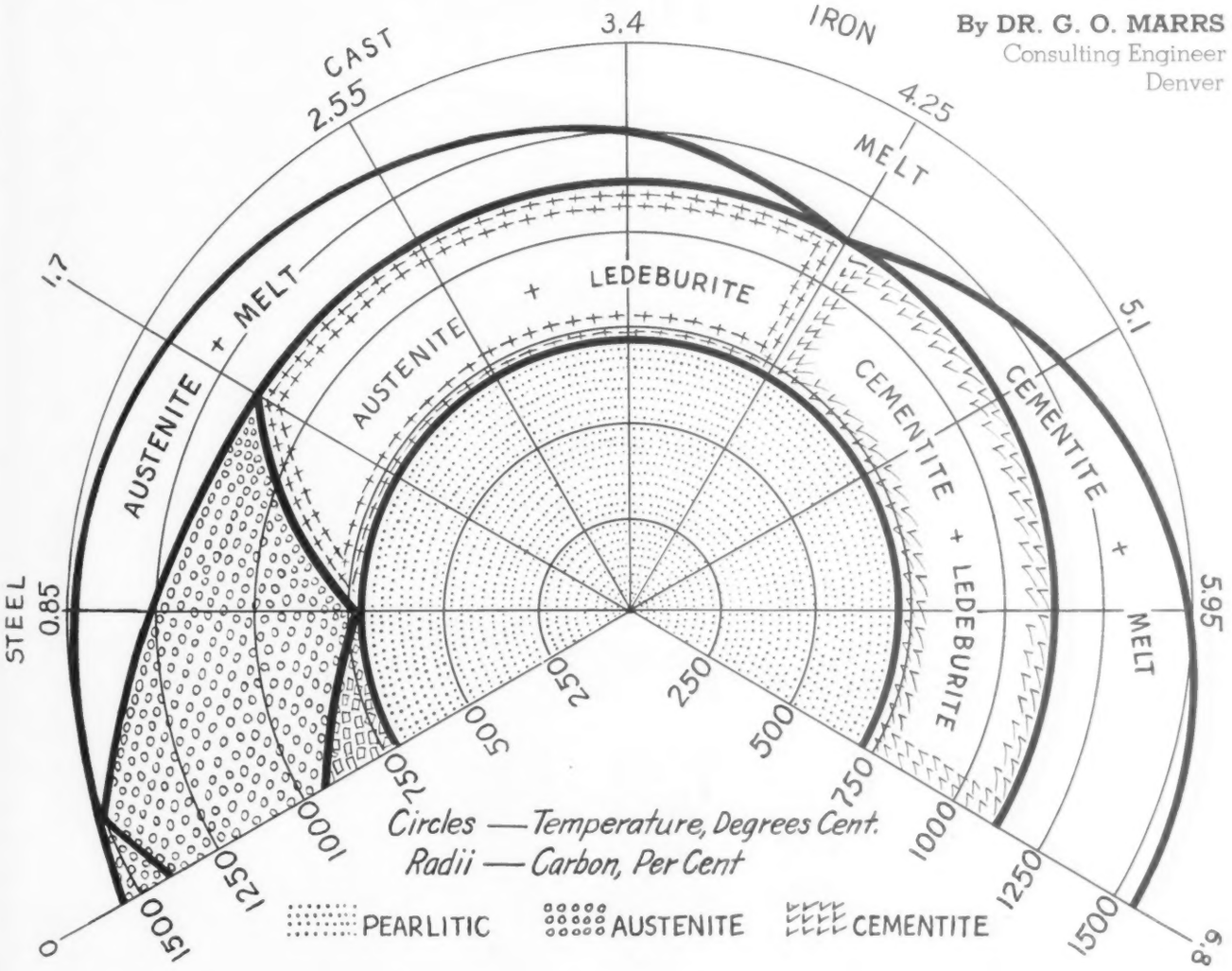
Also where painting is for decoration, it is desirable immediately. Satisfactory painting of zinc surfaces has presented a considerable problem. Special types of galvanizing and chemical treatments of the zinc surface have their respective and important merits. But whether such treatments are used or whether it is necessary to paint ordinary galvanized iron without any chemical treatment, a zinc dust paint appears to be satisfactory as an adherent priming coat.

In many cases, it also may be a suitable finishing coat, though color limitations or desire for an acid-resistant finish coat often gives the preference to some other paint for the finish coat. A primer formula that has proven particularly satisfactory is 80 per cent zinc dust and 20 per cent zinc oxide. By use of nongasing zinc dust and a nonacid vehicle, zinc dust paints are produced which package satisfactorily and give no trouble from gasing or settling. A large number of paint manufacturers are supplying such zinc dust priming paints. These can be tinted to reds, browns and greens with satisfactory results.

Although somewhat apart from galvanizing, a paint of the type just mentioned modified by addition of iron oxide is recognized as a desirable priming paint for black iron and steel and is an excellent shop coat paint. Fifteen to 30 per cent of iron oxide may be substituted satisfactorily for an equivalent percentage of zinc dust.

# Iron-Carbon Diagram in Polar Co-ordinates

By DR. G. O. MARRS
Consulting Engineer
Denver




■ IN TEACHING the metallurgy of iron and steel, the author finds an iron-carbon diagram constructed with polar co-ordinates to be most effective. Possibly such a diagram has other useful applications. Three outstanding features of this type of diagram are:

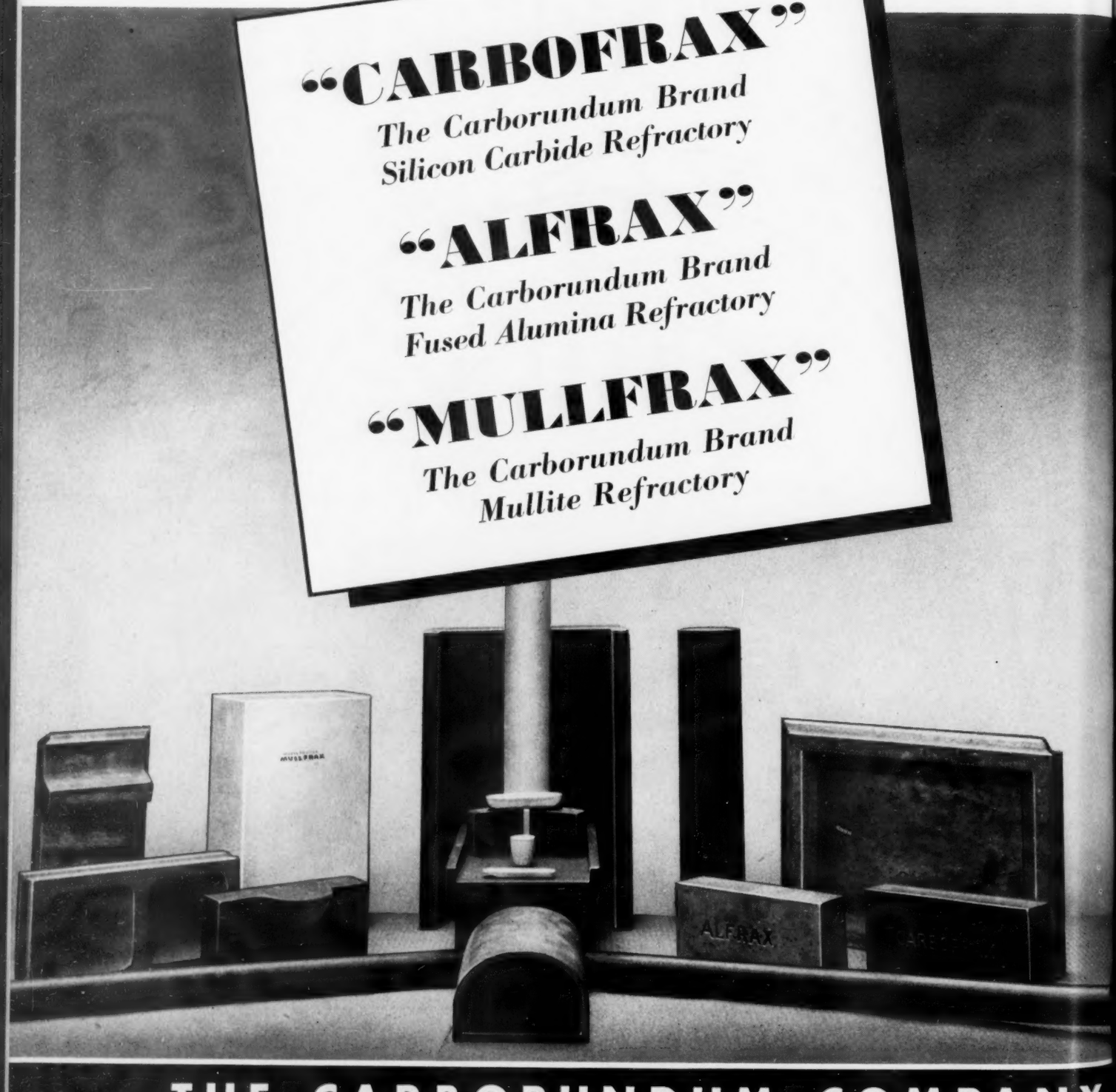
1. The higher temperature part—the live portion—is accented, spread out, and made available for easy and efficient study.

2. By giving the radii spacing an empirical value of 0.85 per cent carbon, the eutectoid, the eutectic, the steel-iron boundary, and the all-cementite line, terminal, fall on main divisional radii and the whole figure comes into a natural division of important parts. Thus the eye travels from pure iron, at extreme left, to total cementite, on extreme right, with all the important stations enroute on natural rather than artificial lines.

3. Reading of a polar diagram is more instructive than a rectangular one for most students and research workers.

# THESE 3 GREAT SUPER

## ... BY CARBORUNDUM ... PLAY AN IMPORTANT PAR IN

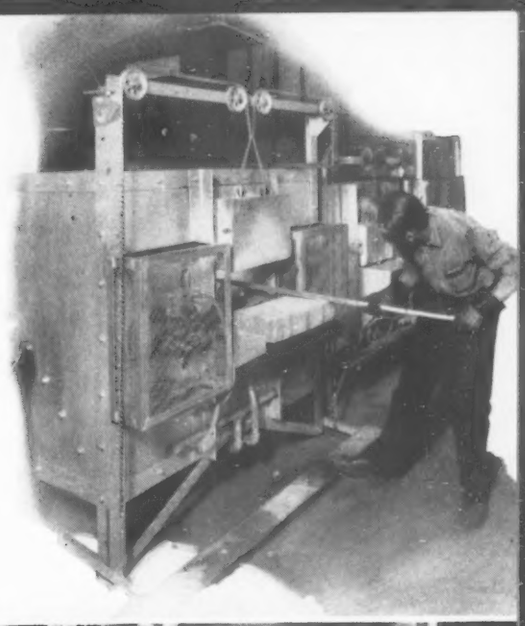



THE CARBORUNDUM COMPANY RE

REG. U. S. PAT. OFF.

# ER REFRACTORIES

## ART IN LOWERING YOUR COSTS



CARBORUNDUM'S three great super refractories have played an important part in reducing both production and refractory costs throughout practically every branch of the metal working industry. These refractories are speeding up production and improving the quality of heat treating products for hundreds of users all over the world.

"Carbofrax," "Alfrax" and "Mullfrax" super refractories are used in the form of muffles, hearths, supports or complete linings in all types of furnaces. Among them may be mentioned furnaces for forging, drawing, tempering, hardening, carburizing and annealing; for sintering tungsten carbide; and furnaces for both ferrous and non-ferrous melting.

In general, the outstanding success of these super refractories in lowering costs is due to the fact that each of them has one or more of the following five important characteristics: (1) They are very resistant to high temperatures. (2) They have extremely high heat conductivity. (3) They are not affected by sudden temperature changes. (4) They stand up under punishing abrasion, and (5) They withstand corrosion and erosion of metals and slags.

We welcome at any time a discussion of your problems and an opportunity to point out how Carborundum's refractories can help you reduce costs. Our representatives will be at Booth A-509, National Metal Congress, Detroit.

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(Carborundum, Carbofrax, Alfrax and Mullfrax are registered trade-marks of The Carborundum Company)

## Y REFRACTORY DIVISION, PERTH AMBOY, N. J.

## Spotwelding Aircraft

(*Continued from Page 74*)

tory results than any other single factor in spotwelding of aluminum alloys. Further progress in the art awaits the development of an improved electrode tip material.

Pressure applied to electrodes is not critical. It may be varied over a fairly wide range, but when one pressure has been selected it must remain constant for the work in progress. An increase in electrode pressure necessitates a higher current setting because it lowers the contact resistance of the material. A higher pressure will reduce pickup to some extent, but too low a pressure permits the current to arc between the sheets, causing an explosion and a burnt hole in the work.

### Electrode Pressure Puzzles

There has been much quibbling as to the correct electrode pressure to use for each gage thickness welded. This is no doubt due to the fact that the current reactance tends to force the electrode arms apart with a force depending on kilovolt amperes used and design of the welder. In some instances this force amounts to 250 pounds which must be subtracted from the calibrated pressure to obtain effective pressure on electrodes.

At first it was believed that short periods of current timing were necessary to weld aluminum alloys and to prevent the zone of fusion from reaching the surface. Further investigation reveals this is not the case. More uniform results may be obtained by using longer cycles in the neighborhood of ten, instead of ½ with a maximum of three cycles. Welding of aluminum alloys differs from that of steel. Due to the short plastic range, an actual slug must be cast in the sheet, whereas steel having a longer plastic range results in what is considered a forge weld. This accounts for the greater variation, and the inherent weakness in tension or tearing of spotwelds in aluminum alloys.

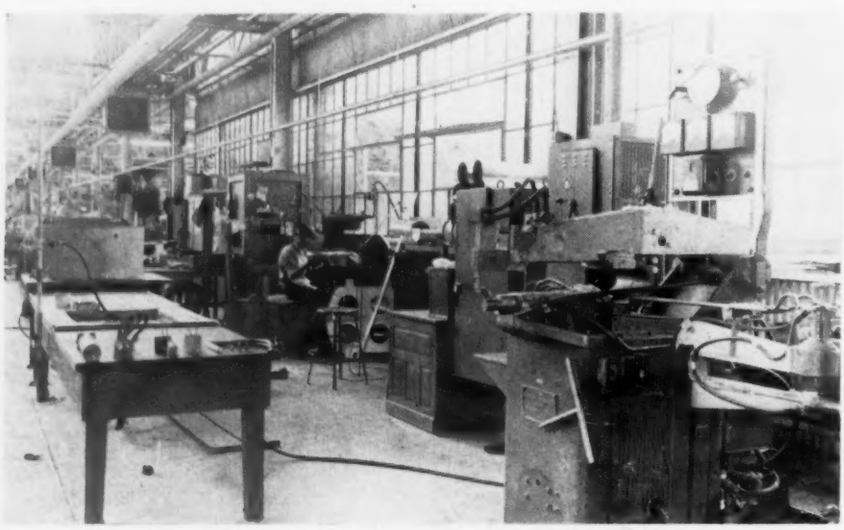
In welding of steel, current dwell above 15 cycles appears to give better results probably due to plastic working of the weld by electrode pressure. Spot welding of stainless steel requires a controlled time of less than 6 cycles to prevent carbide precipitation and deleterious effect on corrosion resistant properties. Chrome moly and high carbon steels are normalized after welding for the welds are brittle due, no doubt, to air hardening characteristics of the steel and quenching effect of the copper electrodes.

Current intensity required to spot weld gages of aluminum alloys applicable to aircraft is supposedly in the neighborhood of 5000 to 30,000 amperes.

Any attempt to correlate amperage to be used to weld certain gages of material appears futile. Procedure employed is to set the other variables and adjust current values to obtain the optimum weld from shear or tearing tests. Most parts for aircraft now spotwelded are unstressed so a weld that will pull a slug with a diameter of four times sheet thickness in a test sample when rolled apart with a pair of pliers is considered satisfactory.

Equipment at Consolidated Aircraft consists of a 125 kilovolt ampere spotwelder combined with a thyratron control panel. Sequence of operation is controlled so when the operator pushes foot button, air pressure is applied to electrodes before current flows and pressure is released immediately afterwards.

**Fig. 2—General arrangement of spotwelding equipment with the cleaning table on the left. Several of the interchangeable welding tools are seen on the table**



An auto-transformer provides thirty increments of current.

Mounted on the welder is an instrument panel containing a dial showing pressure on the work. There is also a weld consistency indicator. This is a ballistic galvanometer combined with a photo electric eye which rings a bell when the indicator covers a beam of light. There also is a zero center ammeter which remains inactive until trouble is experienced with the thyratron panel at which time it deflects violently to one side.

### Small Welder for Steel

To right of the large spotwelding machine is a small welder designed and built at Consolidated. It is used for welding steel as it is impossible to reduce the current sufficiently to weld steel on the large machine. Current is taken from the large welder. The small welder consists of a cast aluminum yoke, single acting cast bronze air cylinder with a spring return, and a micarta piston and micarta packing gland to insulate the upper electrode from the body of the welder. It is operated from the control unit of the larger welder and a changeover entails opening and closing of the air valves from the cylinder of the large machine to that of the small welder. The equipment works well on stainless steel and is good for an electrode pressure of 500 pounds.

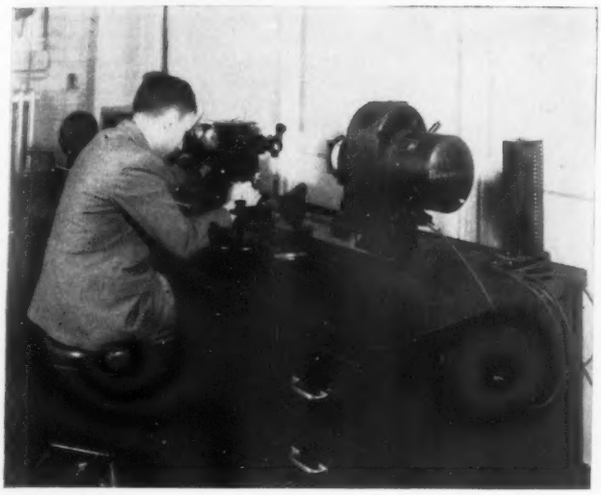
On the opposite side of the large machine is a butt welder used to weld extensions to ordinary drills, using either cold rolled or drill rod for the extension. The machine is fitted with screw clamp jaws and elkonite grips. It will accommodate from a No. 50 up to a 9/16-inch drill, and is capable of welding 50 dozen drills in an 8-hour work day. A saving of about $5 a dozen is realized above the cost of drills purchased in extra lengths besides the convenience of getting an extra long tap or drill when needed.

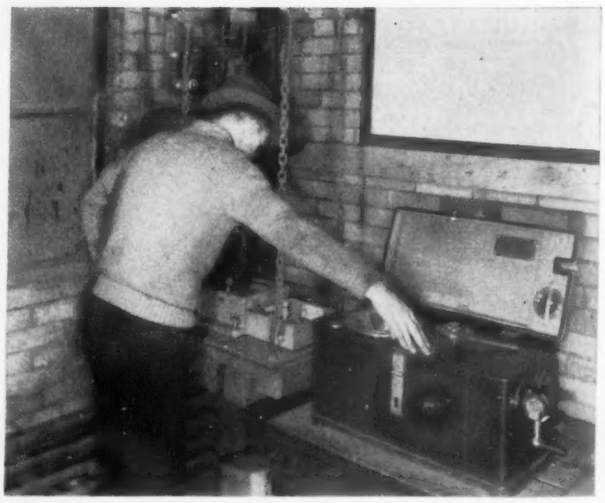
Leads of the butt welder are also connected to the transformer of the large welder and change-over consists of insulating the electrodes apart on the two spotwelders and connecting the air line to the push up cylinder of the butt welder. After welding, drills are annealed as the welded zone is brittle, due to the high carbon content of the drill. Annealing is accomplished by spreading the jaws apart about 2 inches, applying another shot of current, and permitting the welded zone to cool slowly. Drills welded correctly stand up well in service as most failures occur in the fluted section with any standard length drill.

Due to the variety of work en-

(*Please turn to Page 114*)

# TIMKEN Steel Has To Be Good To Get By These Guardians Of Quality





GOOD WILL BASED ON GOOD STEEL

No steel user could be more critical of the quality of the steel he buys than we are of the steel we manufacture.

Every pound of steel made in our plant is under constant scrutiny from the furnaces until it receives the final OK in the long series of inspections and tests that comprise a system of quality control which takes nothing for granted and leaves nothing to chance.

The cost of maintaining a standard of quality as high as that for which TIMKEN Steel is so well known is considerable and it is therefore conceivable that many manufacturers might be tempted to favor their products in the tests to which they subject them. No such leniency has ever been shown in the case of TIMKEN Steel, however—and never will be.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

STEEL AND TUBE DIVISION

**TIMKEN**

***ALLOY STEELS***

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; TIMKEN Rock Bits; and TIMKEN Fuel Injection Equipment.

# Lathe Beds Are Flame Hardened In One Pass

■ SEEKING A WAY to improve life of lathe beds and decrease bed wear has resulted in use of chilled beds, hard chromium plated surfaces, hardened laminated steel strips, beds of welded steel, etc.

Monarch Machine Tool Co., Sidney, O., recently developed a procedure for flame hardening bed ways giving excellent results. These beds are alloy steel castings ranging in hardness from 225 to 240 brinell. After finish planing, the ways are clamped in a water tank with just the surface extending out of the water as shown in Fig. 1.

### Torches Pass Over Ways

Oxyacetylene torches with multiple tips fastened in a carriage traverse the length of the ways at a speed from 3 to 6 inches per minute, depending upon the thickness of the bed section being hardened. Tips are the quenching type, a stream of water following the flame. Depth of penetration of hardened metal varies from ⅛ to ¼-inch or more. In Fig. 1, three sets of burner tips are used hardening the entire top way section of a lathe bed in one pass.

Casting strains are prevented by keeping the bed at room temperature during hardening. Combined action of water surrounding bed and quenching jets keeps the temperature down. Repeated tests show no tendency for hardened portions to crack or flake even under abuse. Typical hardened bed sections have been flexed repeatedly under high pressures without injury to hardened portion. Depth of hardened surface minimizes possibility of injury to way surfaces resulting from chunk or work falling on the bed. Fig. 2 shows typical grain structure.

Hardened way surfaces test around 590 brinell. Distortion is slight, varying from 0.005 to 0.015-inch over length of entire bed. This is corrected easily in subsequent grinding operations where large precision surface grinders produce the accurately finished surfaces required. This setup is used to flame harden beds for all types and sizes of Monarch lathes, in maximum bed lengths up to 14 feet. Way surfaces of these hardened beds are finish ground to a tolerance of 0.0005-inch in their overall length.

In setting up exact procedure details to employ, such as number and size of burner tips, distance of tips from work, speed of flame over surface, experiments are made on short way sections about 13 inches long. After hardening, these test pieces are broken and checked for hardness, strength, distortion, etc.

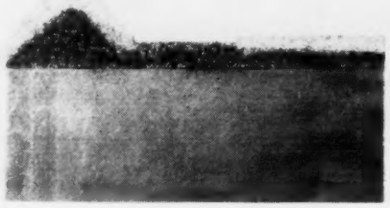


**Fig. 2—Photomicrograph of lathe bed way after flame hardening**

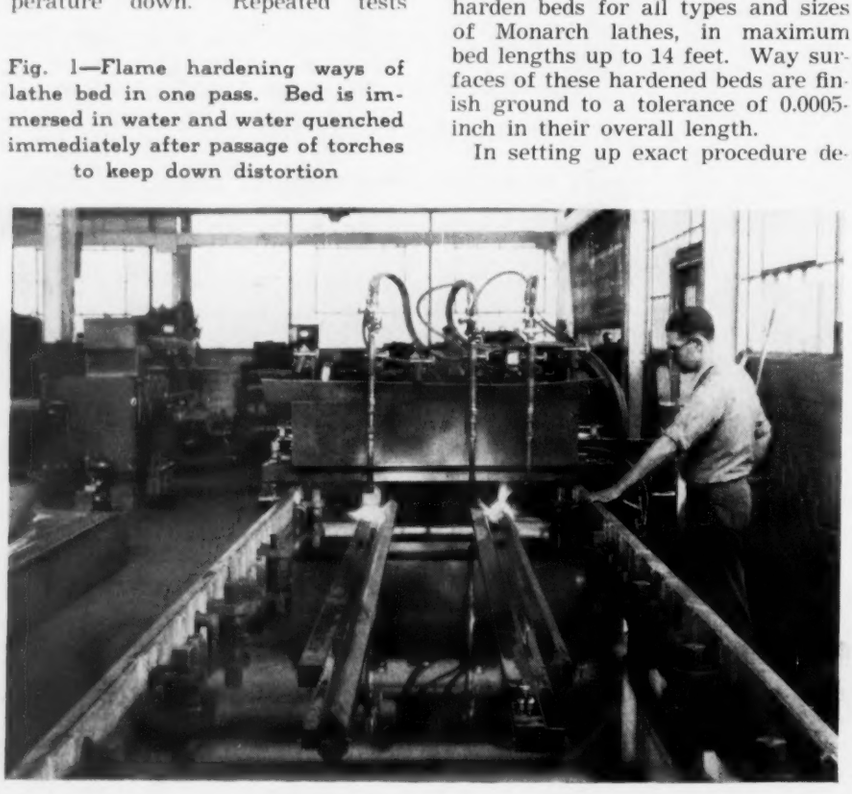


**Fig. 1—Flame hardening ways of lathe bed in one pass. Bed is immersed in water and water quenched immediately after passage of torches to keep down distortion**

## New Volume Deals with Copper in Steel, Iron

■ *Copper in Cast Steel and Iron*, cloth, 136 pages; published by the Copper Development association, London; supplied by STEEL, Cleveland, and in Europe by Penton Publishing Co. Ltd., Caxton House, Westminster, London, S.W. 1.

This recently published volume deals with the use of copper in cast steel and iron, and discusses the effect of copper additions upon the mechanical properties of those metals. It attempts to summarize the results of recent research on the influence of copper in cast steel and iron, and to describe in the light of these results the uses to which copper is being, and may be put, in the foundry.

The book is divided into seven chapters, of which the first is a summary of the uses of copper in cast steel and iron. Chapter II deals with the metallurgical influence of copper on iron-carbon alloys and Chapter III with the influence of copper on graphitization in iron-carbon alloys. Chapters IV and V discuss the effect of copper on the mechanical properties of cast steels and irons, while Chapter VI describes precipitation hardening of copper cast steels and cast irons. Chapter VII deals with the influence of copper on the corrosion resistance of cast steels and cast irons.

The volume is liberally illustrated and well indexed. Appendices include hardness, temperature and stress conversion tables.

## Wall and Ceiling Material Absorbs Sound

■ Developed for use in offices, shops, schools and other public buildings, where reduction of noise and echo is desirable, a new material, known as Acoustilite, for insulating sound, as well as heat and cold, has been introduced by Insulite Co., Builders Exchange building, Minneapolis.

These tile-like boards are furnished in squares and rectangles of various sizes, and can be obtained in two finishes, one with the appearance of soft-surfaced stone and the other an open-mesh fabric covering. Both are painted a neutral buff shade, but further decoration in cold water flat paints will not impair acoustical properties or insulating qualities.

# Wherever Metal is Ground . . .

# NORTON WHEELS

FOR each new development in metals—a Norton abrasive development to meet it. Examples:

The new B-E bond for more effective grinding of high speed tool steels and for more efficient centerless, cylindrical, internal and surface grinding.

Improved cut-off wheels for the production cutting of the new super-hard alloy steels.

Diamond wheels for grinding the cemented carbides.

Norbide abrasive for lapping cemented carbide wire drawing dies.

Improved disc wheels for various types of surface grinding.

Controlled Structure for better duplication of grinding action.

Foundry wheels, billet grinding wheels, roll grinding wheels, mounted points for die work—improvements have been made in each of these, too—keeping them in step with the developments in metals.

It is this continual research and improvement—this keeping pace with metal development—that has made Norton wheels so popular in the metal working industries.

NORTON COMPANY
WORCESTER, MASS.

New York Chicago Detroit
Philadelphia Pittsburgh Hartford
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NORTON ABRASIVES

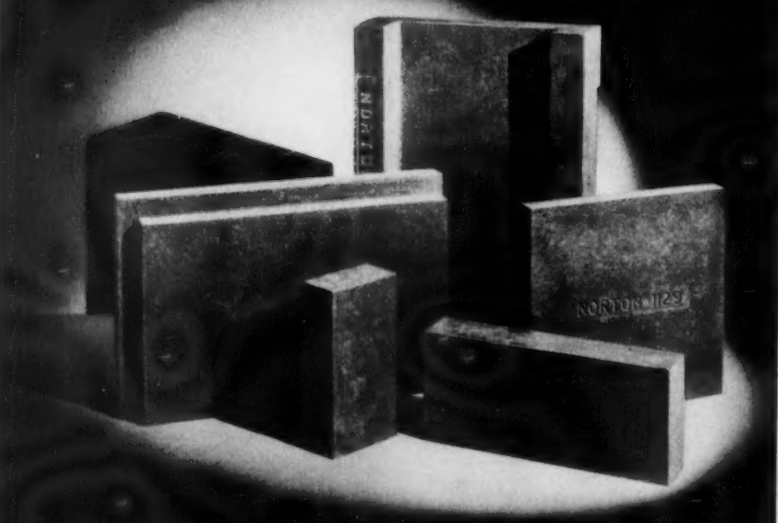
Alundum, Crystolon and Norbide are Norton trademarks registered in United States Patent Office

# FOR MELTING METAL

## *Alundum, Crystolon* and Fused Magnesia Cements and Bonded Shapes

RESISTANCE to high temperatures, chemical resistance, and low penetrability to molten metals and oxides—it is these features of Norton Refractories that are enabling them to cut lining costs in many types of furnaces for melting ferrous and non-ferrous metals. The several types of refractory materials and the different mixtures in each make it possible to exactly meet individual conditions.

# FOR HEAT TREATING METAL

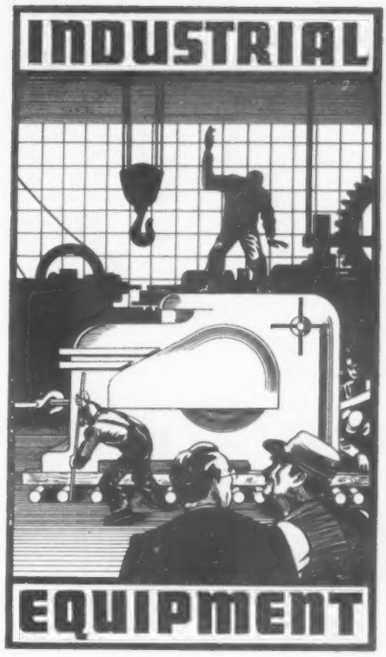


## *Crystolon* Hearth Plates and *Alundum* Burner Tunnels

HIGH refractoriness, great strength, high heat transfer, resistance to spalling and resistance to abrasion—these five features of Crystolon Hearth Plates are assuring long lining life and low fuel cost in heat treating furnaces of many types. In gas and oil fired furnaces Alundum Burner Tunnels are popular because they resist high temperatures and do not oxidize—assuring long life.

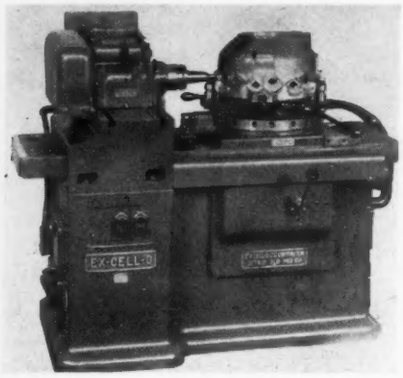
See all of these NORTON PRODUCTS at Space A-242 NATIONAL METAL EXPOSITION

NORTON REFRACTORIES




## Bores Pushrod Holes In Aircraft Engine

■ Ex-Cell-O Corp., 1202 Oakman boulevard, Detroit, has designed and built a single spindle precision machine for boring 18 pushrod holes



in aluminum alloy valve-gear case of a 9-cylinder radial aircraft engine.

Case is mounted on a rabbet and located radially by a flatted plug. A spring loaded plunger is provided for accurate hand-indexing, plunger snapping into locating holes when correct index is reached. Upper half of fixture is raised and lowered by a hydraulic cylinder. On lower half of fixture 18 buttons are provided for locating work for height for each pushrod hole.

Indexing table itself is locked by hydraulic cylinder during boring operation. Production is at rate of 5½ cases per hour.

## Skid and Lift Form Materials Handling Unit

■ Lewis-Shepard Sales Corp., 245 Walnut street, Watertown, Mass., recently has introduced a materials handling system consisting of a semi-live skid and a 2-wheel lifting unit.

Lifting is accomplished with a fast, direct-action single stroke. Lifting unit is arc welded and is equipped with large dual wheels and roller bearings. Carrying platform has a smooth hardwood top surrounded entirely by an arc-welded steel frame. Double side girders hold top firmly in place without use of bolts or rivets. Wheels of either lifting unit or platform may be metal or rubber-tired.

## Lower Head for Concrete Breakers Is Alloy Steel

■ Quality Die Co., South Chicago, Ill., has announced a new lower head and alloy moil point, without collar, for concrete breakers.

Lower head is said to be 3 inches shorter than conventional type heads now in service. It is heat-treated alloy steel, and is fitted with a replaceable hardneded and ground steel bushing. Key that holds moil point in lower head without a collar locks itself in place and will not vibrate out in service.

## Time-Lag Fuse Has Thermal Overload Cutout

■ Trico Fuse Mfg. Co., Fifth street, Milwaukee, has announced a thermal time-lag fuse, known as the Trico-Matic, equipped with a thermal over-

load cutout which holds starting and momentary overloads, yet gives safe and dependable protection on prolonged overloads.

This special fuse can be used in place of ordinary fuses on circuits having motor-driven machinery or on appliances such as washers and refrigerators. In some instances, it eliminates necessity of heavier wiring, installing circuit breakers or separate thermal devices, it is claimed.

Special features include: Color indicator for all popular sizes; all-porcelain shock and ven-proof top; a flag indicator when blown; large ampere rating on window; a flat releasing spring under copper link giving maximum travel in opening arc when blown.

## Eccentric Gears Drive Press Plunger

■ Clearing Machine Corp., 6499 West Sixty-fifth street, Chicago, has developed a line of crankless steel presses, embodying welded frame construction, eccentric plunger drive and other improvements in design.

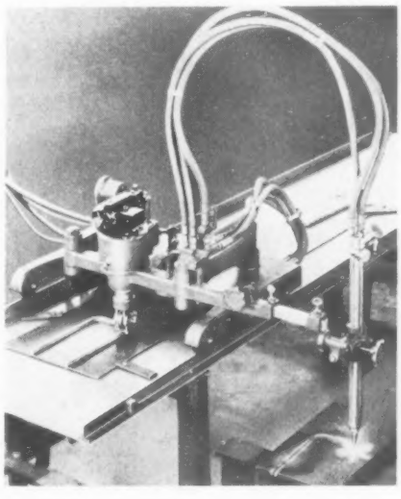
In these presses, eccentric gears replace crankshaft of ordinary presses. They deliver their power through guided plungers to the slide, free from torsional deflection. Main bull gear is combined with eccentric into one solid steel member. Slide plungers are guided in the crown, eliminating all side thrust. At any position of stroke all forces are applied vertically.

Air clutch is designed for a low moment of inertia. This permits minimum accelerating and decelerating loads during engagement. Clutch and brake are mechanically interlocked.

These double-action presses include some of the largest in industry, one of which is used to draw one-piece top of a Chevrolet panel truck in a single operation.

## Speedometer Indicates Rate of Metal Cutting

■ The Linde Air Products Co., 205 East Forty-second street, New York, has introduced an addition to its



line of portable metal-cutting machines, the Oxweld type CM-15, a shape-cutting unit said to combine many of the desirable features of portable and stationary machines.

Maximum range of blowpipe movement is 60 inches lengthwise and 18 inches laterally, and cutting speed can be varied from 3½ to 28 inches per minute. A speedometer indicates rate of movement.

Templet-tracing, hand-tracing, automatic circle-cutting and straight-line cutting are all within the scope of operation of this machine. Bevel-cutting up to an angle of 45 degrees can be done in either direction by shifting angle of blowpipe. A supplementary blowpipe bar, furnished with machine, permits use of two blowpipes for simultaneous cutting of similar shapes.

## Processing Time Switch Is Regulated by Dial

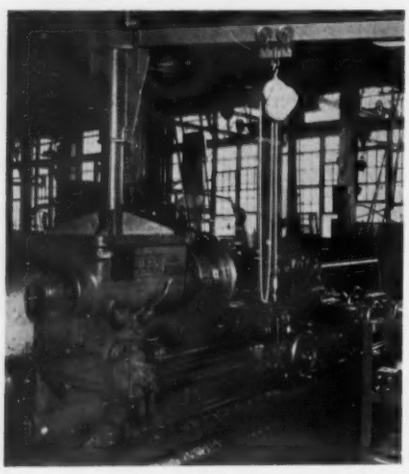
■ General Electric Co., Schenectady, N. Y., has developed an automatic time switch for process timing and similar applications.

Total time cycle of each switch is fixed dependably, as contact-making mechanism is driven through spur gear train by a Telechron motor. By rotating a dial, user may regulate time instrument is on. Silver contacts are mounted on the brushes, which bear on rotating cams. Steps in these cams snap contacts open and closed at desired intervals. Contacts are rated 10 amperes at 230 volts.

## Capacity of Machines Increased by Jib Crane

■ Shaw-Box Crane & Hoist division of Manning, Maxwell & Moore Inc., Muskegon, Mich., has introduced a revolving, self-supporting jib crane for use with an electric hoist in loading and unloading work being machined on lathes and similar tools.

Lifting unit used with this crane is the portable Budgit hoist, a product of the same manufacturer. Loads varying from 250 to 2000 pounds can be handled by this type of hoist. Unit operates from a lamp socket or power receptacle and requires no special installation. It is said to weigh less than standard hand-operated hoists.

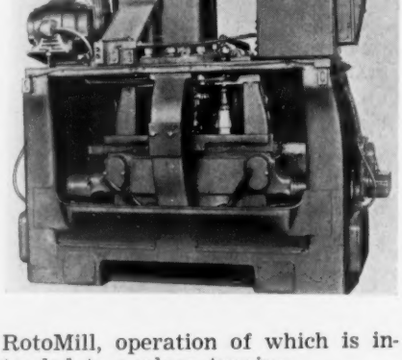


Crane is built for either mounting on machine tool being served or for floor mounting. On either type of installation boom is 8 feet above the floor and has an effective radius of 6 feet. Maximum capacity is 1000 pounds.

Use of this crane is said to reduce time required to load and unload machines, thus increasing their capacity.

## Rotary Cutting Replaces Turning on New Machine

■ National Broach & Machine Co., 11455 Shoemaker street, Detroit, has introduced a milling machine, the



RotoMill, operation of which is intended to replace turning.

Because it utilizes large diameter milling cutters instead of a single-end cutting tool, this machine is not vulnerable to high friction temperatures. Work piece is said to be only slightly warm at end of cycle.

Machine consists chiefly of a reciprocating table which carries a vertical work spindle on each end and two vertical, centrally-located cutter spindles. Cutter load on one side of work piece is equalized by a similar load diametrically opposite. Moving from loading position, table carrying work spindle rapidly approaches cutter spindles. Travel is automatically retarded when cutting begins. When work spindle has reached a point in the plane between cutter spindle centers, it starts to rotate and continues through either 185 or 370 degrees, depending on nature of operation, after which table returns to its original position.

Any type of cylindrical, conical or flanged work may be machined. In normal production, parts are said to be held to an indicator limit of 0.004-inch at all points, eliminating need for additional finishing out in many cases. Round or conical work up to 3-inch diameters, when cut by duplicate opposed cutters on a 185-degree rotary cycle, can be turned out at rate of one every 25 seconds.

## Current Regulators Are Air-Cooled

■ Westinghouse Electric & Mfg. Co., Pittsburgh, has introduced two station type constant current regulators, which will operate at 50 per cent load for 15 hours with a temperature rise not exceeding 55 degrees Cent. above ambient temperature.

Non-automatic type regulator is designed to operate in an indoor sub-station with manual control. It will regulate from full load to no load within one per cent of rated secondary current when operated at rated primary voltage and frequency and on unity power factor load. It is air-cooled with a shell type core of transformer steel.

Automatic regulator is designed primarily for use in an unattended substation. It has a higher inherent reactance than the non-automatic type, and therefore under practically any condition of load it gives much better protection to series lamps.

## Grinders Are Versatile

■ Black & Decker Mfg. Co., Towson, Md., has announced two high-speed portable grinders with wheel capacities of 2 and 2½ inches.

These are precision tools, having a no-load speed of 19,000 revolutions per minute. Grinders are 13½ inches long and weigh 3½ and 4½ pounds, respectively. Having been designed for use where a small size wheel is required, these tools are said to be quite versatile in their general application. They are particularly easy to handle where accuracy and fine grinding are necessary.

## Gasket Has Spring Action

■ Johns-Manville Inc., 22 East Fortieth street, New York, has developed a spiral gasket for sealing boiler manholes, handholes and tube plates.

Known as the Spirotallic gasket, it is constructed of preformed plies of asbestos and cold-rolled, cadmium-plated steel. Material is spirally wound in such a manner that asbestos serves to seat adjacent, interlocking plies. As soon as compression is encountered, rigid edges of plies meet bearing surfaces of manhole, handhole or tube plate to form a series of metal barriers that provide an effective seal against extreme pressures and high temperature conditions. A feature of these gaskets is their ability to compress under flange pressure and then to rebound when pressure is removed. Resiliency is obtained largely by

# *Here's where*
# YOUR SALES VOLUME
# *is finally determined*

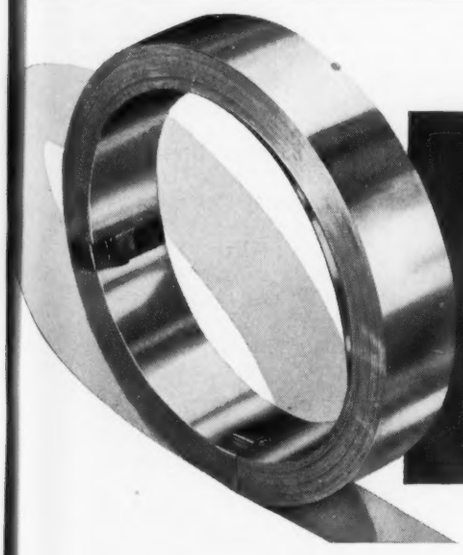
*WHETHER* you make complete products or parts it is the individual customer's preference that regulates your sales volume—and profits.

More and more manufacturers are turning to American Quality Cold Rolled Strip Steel because they have discovered that products made from this versatile material have the attractive, eye-catching gleam that makes sales. And because they have found, also, that the use of this material cuts costs.

American Quality Cold Rolled Strip Steel comes in a wide range of finishes, edges, tempers and widths. It is ideal for products or parts that must be light in weight, accurate in size and have a smooth finish.

We can help you. It has been our privilege to assist many customers in planning the economical application of Cold Rolled Strip Steel to their requirements. So why not put your problems up to our engineers and metallurgists?

*Be sure to visit our exhibit at the National Metal Exposition in Detroit, October 17-21. This exhibit will be located at Space B-121.*



USS

## AMERICAN *Quality* COLD ROLLED STRIP STEEL

**AMERICAN STEEL & WIRE COMPANY**

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

**UNITED STATES STEEL**

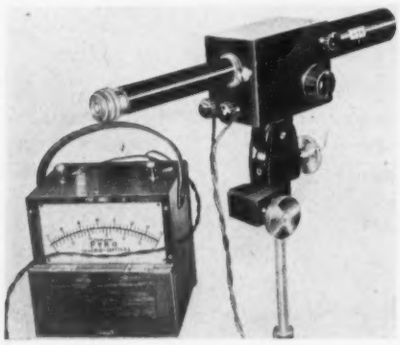
central crimp of interlocking plies, which provides a constant spring action.

Gaskets are available in standard sizes in both round and oval form. Special shapes can be manufactured on short notice.

## Employs Light Filters To Measure Temperature

■ Pyrometer Instrument Co., 103 Lafayette street, New York, has devised a patented, self-contained, combined color pyrometer, temperature-measuring principle of which is based on use of light filters and color wedges which are transparent to a number of colors simultaneously.

By using filters with a number of transparencies both for separation and for mixing and toning down, any complicated optical or mechanical device for production or combination of colors is rendered superfluous, it is said. With this Pyro



Bi-optical instrument temperature of "black body" and "actual" temperature may be ascertained simultaneously.

Pyrometer is furnished with scale ranges from about 900 to 1900 degrees Cent. or 1700 to 3400 degrees Fahr. It may be used for numerous laboratory and research applications including incandescent iron and iron alloys in open and flame-heated furnaces.

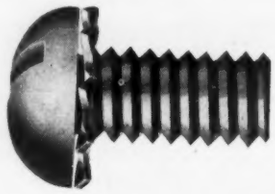
## Fire-Fighting Equipment Employs Water Spray

■ Spray Engineering Co., Somerville, Mass., has announced a line of Fire-Fog nozzles for combatting industrial oil fires, particularly in open containers, transformers, dip tanks, impregnating tanks, etc.

These nozzles use a water spray rather than special chemicals, combining a blanketing and cooling effect in extinguishing flames. Nozzles may be used coupled directly to hose or in conjunction with play pipes. After tests with water pressures from 20 to 160 pounds per square inch, equipment was approved by laboratories of Associated Factory Mutual Fire Insurance Companies.

## Assembly Unit Combines Screw and Lock Washer

■ Shakeproof Lock Washer Co., 2501 North Keeler avenue, has announced a new patented assembly unit, a pre-assembled lock washer



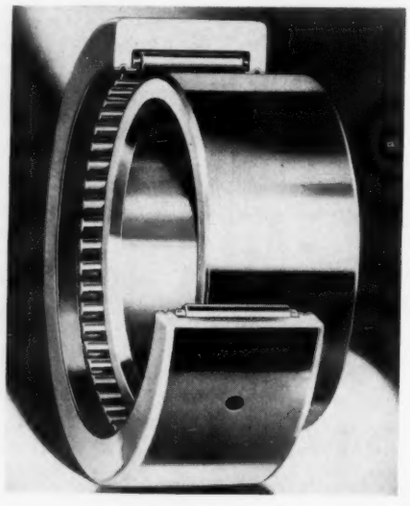
and standard machine screw, called SEMS.

Use of this fastening device is said to speed up production, reduce labor costs and eliminate such waste as lost lock washers. Each screw is equipped with the correct size lock washer for its particular type of head. As washer cannot drop off, no screw can be applied without having a lock washer under its head.

## Quill Bearings Feature Self-Contained Design

■ Bantam Bearings Corp., South Bend, Ind., has introduced a line of self-contained quill roller bearings, designed for heavy duty service, but still of such proportion as to retain advantages of this type bearing—small space requirement, high load carrying capacity and economy.

No radial load can be exerted on roller trunnions or retaining bands in operation, it is said. Retaining bands are spring steel, definitely located and fastened in grooves in outer race ribs. Race is a single



channel-shaped piece, hardened and ground to precision limits. Ribs, an integral part of the race, provide solid abutment for ends of rollers.

Lubricant is supplied to bearing through oil holes in outer race. Bore of outer race ribs is held relatively close to inner race outside diameter to help maintain lubricant supply within bearing. Straight inner races are used, allowing installation of inner race separately from outer race. Inner race can be eliminated where shafts are properly hardened.

This series of bearings is designed for maximum number of correctly proportioned rollers, and roller trunnions are made with largest possible diameter, thus providing maximum end surface. These bearings have been applied successfully where theoretical roller speeds exceeded 60,000 revolutions per minute.

## Unit Magnetizes with Alternating Current

■ Magnaflux Corp., 25 West Forty-third street, New York, has announced an improved magnetizing

unit of the transformer type, designed to accommodate parts up to 72 inches in length.

Known as Magnaflux DT-type, unit provides means for magnetizing circularly by use of low-voltage alternating current supplied from secondary of the transformer to two contact heads. Part to be magnetized is placed between these heads in a horizontal position. Unit provides also for demagnetization of a part.

Model illustrated has a tank for holding liquid inspecting medium and a circulating pump and hose for flowing liquid over part while it is between heads of machine. Magnaflux D-type unit is similar except for these particular features.

## Unit Sifts Dry Material

■ Ajax Flexible Coupling Co., Westfield, N. Y., has placed on the market a single-deck batch screen for shifting dry material on test work and low tonnage jobs where accuracy of separation is important.

Screen is totally enclosed, dust

tight, with both feed and discharge spouts arranged for boots. Cloth area of deck measures 12 by 24 inches. Cloth and frame can be changed in 30 seconds. Overall dimensions of complete unit are 36 inches long, 18 inches wide and 15 inches high. Shaker is V-belt driven by a ½-horsepower alternating-current motor.

## Develop Electrical Unit For Industrial Heating

■ General Electric Co., Schenectady, N. Y., has developed a high-speed Calrod heating unit for industrial applications that require temperatures as high as 1500 degrees Fahr.

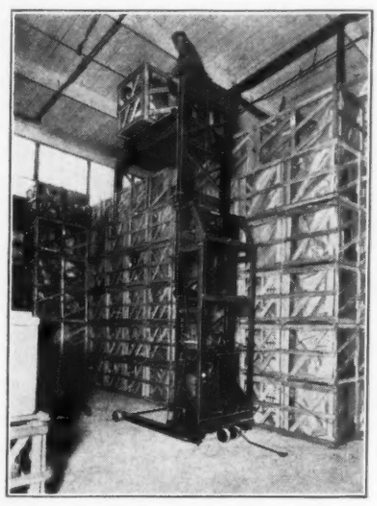
Although standard listed ratings range from 750 to 3500 watts, and effective heating lengths ordinarily range from 18 to 84 inches, other sizes and ratings can be manufactured as required. Among uses of product are applications in high-temperature air heating, industrial ovens with air temperatures up to 1000 degrees Fahr., hotplates, and various metal surfaces.

## Telescopic Device Piles Crates in Warehouse

■ Revolvator Co., North Bergen, N. J., has placed on the market an electric, telescopic stacking device, shown below piling enameled stoves.

Known as the Revolvator, this unit can pass freely under roof trusses in a warehouse and yet pile higher than the bottom chord of trusses in each bay. Safety is an important feature. Current is shut off automatically should operator elevate machine while directly under a truss or low point. Another device prevents platform from falling in event of cable breakage. If cable becomes slack for any reason, current is cut off.

Stacking units are built in sizes suitable for any warehouse or current.



## Submerged Heat

(*Concluded from Page* 86)

combustion are as yet unknown. However, the main advantage appears to be the extreme agitation given to cleaning and pickling solutions. This resulted in a 104 per cent increase in production in a steel plant in the Calumet region where the system was used in pickling wire rods from No. 5 gage to 13/16-inch diameter. The only reason production was not increased further was the inability of the men and auxiliary equipment to handle the steel at a faster pace.

In another mill pickling sheets up to 80 inches wide by 14 feet long, an increase of over 100 per cent has been noted in the few weeks submerged combustion has been used in place of other methods.

A second advantage of submerged combustion for pickling is its flexibility. Each pickle tank in a plant can operate as an individual and efficient unit. It is not dependent upon a central generating system whose efficiency falls off at anything under a full load rating. This is particularly important in small plants where the boiler is used for nothing save heating the pickling vats and the plant itself in winter. One plant operating under the above conditions found it advantageous to discontinue operating its boiler and to install unit heaters for heating the plant using submerged combustion units to heat all of the pickling vats.

### Heat Consumption Lowered

Another important advantage is the constant temperature which is so easily maintained using submerged combustion burners. This means higher quality of product and prevents excessive heat consumption.

A more uniform and better pickle is obtained faster than could possibly be done in a still acid vat. In one company rejections of wire rod coils were reduced from approximately six loads per day to one load every two weeks by use of submerged combustion heating equipment, agitation and constant temperature.

Submerged combustion evaporates water from the bath instead of diluting it by adding water. When open steam jets are used to heat pickling tanks, the steam condenses in the solution thus diluting it and raising the working level of the vat until it is necessary to drain off part of the solution to maintain the correct working level, a certain percentage of acid being lost in the excess solution. Thus it becomes necessary to add acid to strengthen the acid concentration.

Using submerged combustion equipment, direct firing in the solution evaporates water, increasing acid concentration and lowering level of liquid in the tank. Water then is added to maintain the correct working level. The only acid lost is that which goes into chemical reaction with the steel and the small amount lost in dripping or splashing when a load is removed from the tank. This makes it possible to save from 25 to 50 per cent of the acid added during the life of the solution.

These advantages develop a total saving of about 50 per cent of present pickling costs. Faster pickling cuts labor cost at least in half. The system also saves in acid, produces fewer rejects and a more uniform, higher quality, product for the customer. One steel company has shown a savings of 97 cents per ton of steel pickled. It is possible to pickle one ton of steel rods at a fuel cost of 5 cents per ton using 1000 B.t.u. gas at 50 cents per thousand cubic feet.

♦

## Alloy Pump Parts Resist Corrosive Liquids

■ Several grades of AMSCO chromium-nickel alloys successfully resist corrosion when used for pumps handling corrosive liquids, according to a recent report of the metallurgical laboratory at American Manganese Steel division of American Brake Shoe & Foundry Co., Chicago Heights, Ill.

Used for some time on pumps handling sulphurous mine water without corroding, alloy now is being applied to pumps for handling other corrosive liquids in chemical plants and processing departments.

Alloy used for chemical pumps contains 26 to 28 per cent chromium and 10 to 12 per cent nickel.

## Prevents Adhesion of Weld Spatter to Metals

■ Prevention of adhesion of weld spatter to metals is accomplished by a new material called Glyptal No. 1294, recently announced by General Electric Co., Schenectady, N. Y.

Preparation is sprayed on metal to be welded. A thin coat will protect work as well as a thick coat, if surface is covered completely. On surfaces to be painted, material serves further as a priming coat. In addition, it prevents formation of rust on steel in storage yards.

This material can be used without harm on any metal surface, including polished stainless steel. It will withstand temperatures up to 600 degrees Cent. for one-half hour, after which time it will begin to evaporate.

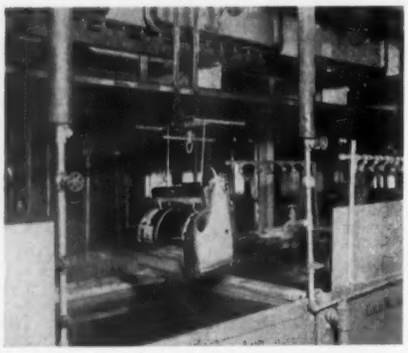
## Cash Registers

(*Continued from Page* 78)

set is in the wheel room being rejuvenated, the other set is in use.

Material is low-carbon punching steel of the cold-rolled type. A bank of one day's work is kept back of the polishing department. After polishing cabinets are hung on conveyors they are taken to vapor and liquid degreasers.

A feature of the conveyor chain where it enters the degreaser is a set of electric eyes on either side of the chain which stop the chain drive if any of the parts are hung in such a manner as to extend out-

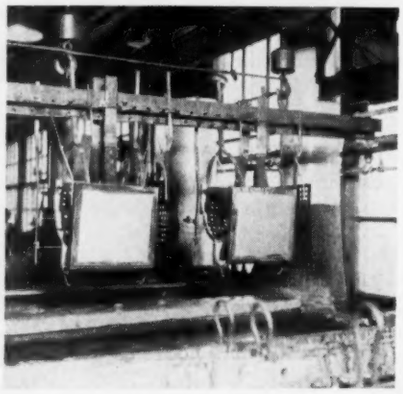


**Close-up of automatic plating machine showing a cabinet being lifted from one tank to the next tank**

side the limits of the degreaser opening. This prevents jamming at entrance to degreaser.

Following degreasing, cases are transferred to carriers and proceed through a soak cleaning bath, an electric cleaning bath, a rinse, a hot sulphuric acid bath and two cold water rinses.

After being cleaned and rinsed



**Cabinet snapped over spring frame carried on a monorail hoist which dips work in successive tanks during chromium plating**

the cases receive a copper strike, two cold water rinses, a cold sulphuric acid dip and two more cold water rinses, the last one being in the form of a spray. All of these cleaning and rinsing operations are part of the automatic nickel-plating equipment which constitutes one of the largest of these installations in the country.

Cases then proceed to nickel-plating tank which extends the full length of a large, separately enclosed room containing the loading stations and various conveyor lines. Main tank holds 7000 gallons of electrolyte. Anodes are 99.9 per cent pure nickel. They are sacked to minimize roughness of the deposit. A current density of 20 to 30 amperes per square foot is employed. Hydrogen ion concentration or pH is maintained between 2½ and 2¾ points.

Nickel layer deposited varies between 0.00075 and 0.0012-inch in thickness. After drying, nickel surface is buffed and chromium plate applied. Chromium plating is done in a series of tanks in batches and is not continuous as are previous nickel plating operations. Work is loaded on clamp fittings hung in

**Frosting letters into chromium plated surface using a blast of flour emery suspended in water, applied through a transfer as shown**

racks and carried through the varicus dips and plating baths on an overhead monorail system. Elevating hoist sections are employed in immersing work in plating baths. Chromium-plating potential is held at 4 to 6 volts and current density ranges between 140 and 160 amperes per square foot. After drying the plated surfaces are buffed to remove water stains and any greyness on corners.

On the "National" cash registers, this name is applied over a chromium-plated section reserved for it by frosting the letters into the chromium. This is done in a special booth set up to handle this work. Flour emery No. 320 suspended in water is applied by air blast to put a frosted finish on letter areas which are exposed through transfers applied to the chromium plated surface.

After chromium plating, cases are inspected on the chain conveyor and go on to another floor where they are washed. Chromium plating then is masked over with tape and the crinkle finish is sprayed on. Finish is dried at 150 degrees Fahr. for 25 minutes after which masking tape is removed and the chromium finish cleaned with benzine. Following this, work proceeds to an

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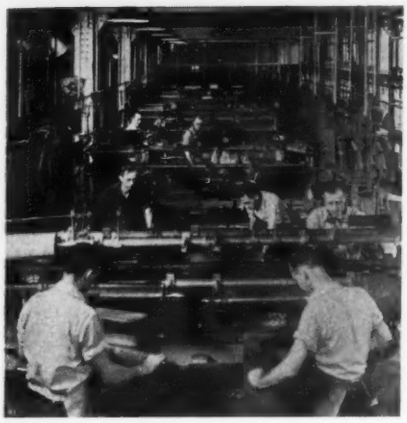
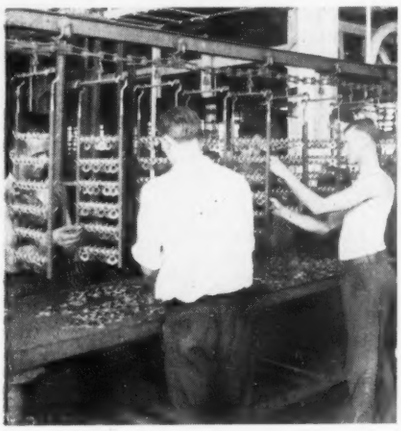


**Applying grain finish using composition rolls and engraved plates**

oven where it is held at 375 degrees Fahr. for 90 minutes to harden the finish. This completes operations



**Racking small parts on hangers preparatory to placing racks on conveyor through an automatic plating machine**

involving those cases with crinkle-finish panels and chromium-plated trim.

Many other finishes are used. One

**Enameled cases go through a "burn off" oven, the delivery end of which is shown here. They will soon be enameled**

of these involves grained finishes employed on a large number of cases. Finishing procedure is as follows: After stamping and forming operations, grease and oil are burned off at 1100 degrees Fahr. Work then proceeds to the finishing department on chain conveyor where the first coat or ground color is baked 1½ hours at 220 degrees Fahr. Second ground coat is applied and given the same bake after which work is sanded in a special air sanding machine and passed to the graining department.

Grain to match any of a wide variety of woods is applied by means of composition rollers taking up ink from an engraving. Color is applied to engraving from a color roll after which top of engraving is scraped clean so roller picks up color only from the depressions in the engraving, thus matching grain desired. Roller carrying grain then is applied to the cabinet by hand.

Since the composition roller transferring the grain to the cabinet must be cleaned each time after it is used, cleaning these rollers is a large factor. To facilitate this work special equipment was devised. The cleaning equipment now used operates as follows: Composition roll is placed

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on two other rollers revolving in a tank of benzine which thoroughly flushes roll surface removing the coloring material. Composition roll then is placed on a set of rolls over which an endless canvas belt is passing. This belt extends from working level to floor level and back, passing over several rollers so its combined movement and exposure to the air keeps it comparatively dry. Cleaning liquid also is highly volatile and so reduces wetting of the belt. In actual operation, placing composition roller on revolving belt dries it almost instantly.

This setup greatly facilitates the graining operation, the cleaner being made in a double unit with one set of flushing rolls and two drying belts. Two operators can use it continually. In operation it is possible to clean the roller by simply placing it on the flush rolls, lifting it off and placing it on drying belt which cleans and dries the roll very quickly.

After graining, cabinets are baked 1½ hours at 225 degrees Fahr., then proceed to cold air cooling room and are finished in lacquer. There is a distinct trend toward use of synthetic lacquers in this work.

Operations described above involve only the cabinets or cases used to enclose cash registers. In addition there are many small parts extending on the outside of the case such as operating levers, keys, escutcheons, etc., which are electroplated. Most of this work is handled in batch plating equipment, or on full automatic plating machines.

Other parts which are plated for corrosion resistance only may be given a zinc plated finish. Accompanying illustrations show some of the many types of plating equipment used for this work at the National Cash Register plant.


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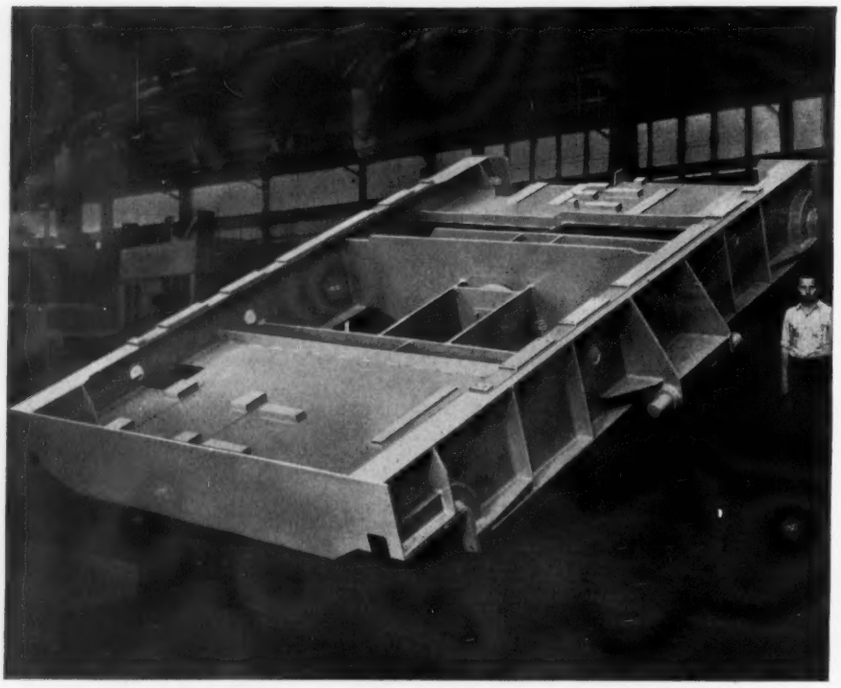

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MATERIALS HANDLING EQUIPMENT


# Legs on Tote Boxes an Aid

■ ONE OF the problems in connection with tote boxes is lifting them on to the work table for processing. Large tote boxes when filled are too heavy to handle. Too many small tote boxes are required for work on large quantities. Also, as the size of parts increases the loading efficiency of small boxes decreases.

To facilitate handling work in the auto hinge division of Atwood Vacuum Machine Co., Rockford, Ill., tote boxes are built with legs to make them work-table height. These boxes are built about 3 feet long by 10 x 11 inches in cross section to give them a slight taper for ease in removing parts. Top of the box or work-table height is 30 inches from the floor. Boxes are of light plate riveted at the corners to four 2-inch angle iron legs. Horizontal reinforcements join the legs about 6 inches from the floor.

### Handle Heavy Loads

A box weighs 90 pounds when empty. It holds approximately 300 pounds of automobile hinge parts. For short hauls, as from one machine to the next, these boxes are handled by a two-wheeled box or barrel type warehouse truck. Two short arms fastened to truck above the lifting lip slip under the cross reinforcement between two side legs. The tote box is tipped over against the truck and handled like a barrel.

For longer hauls two or three of these boxes may be handled at a time on a lift platform truck of either the hand or power type by making leg reinforcing angles of the proper height.

Chief advantages of these boxes lie in their relatively large capacity and the ease with which they may be handled by an inexpensive truck. Also parts are always work-table height and within convenient reach of the operator without stooping, bending or excessive reaching.

## A.I.S.E. Papers Cover Many Items of Interest

(*Continued from Page* 81)

alternating current is superimposed upon this direct current while striking the arc.

A few rectifier type welding sets are in use. In general, lower standards of equipment exist as companies are not likely to discard an old but still usable machine for a new model, even though it has improvements of importance.

One of the unusual types of rod encountered was one consisting of a core rod wrapped in a spiral with a wire, flux added over this, and a steel tape overall. This permits contacting from outside on automatic equipment and allows comparatively sharp bends to be made during application. As yet, this type is not developed in sizes larger than 3/16-inch diameter.

It is interesting to note that nearly everything is made by welding often with four to five times the number of parts that are necessary.

Very little work handling equipment is seen. Manipulators are just being considered. There is one prominent exception to this. A builder of railway cars sets the entire car in a cradle and revolves it to completely position for down hand welding.

Annealing is unfamiliar to welding users in Europe. In spite of this, they have very little trouble.

Welding is being employed with free machining; that is, parts are machined first and then welded together to close tolerances, being held within 0.008-inch on one job encountered.

Due to inability to obtain alloys easily, little alloy welding is done.

### Spot Welding Rare

There is little spot welding equipment in use except in the railway and automobile industries and even here, no high power or fast equipment is encountered. No tube control is used. One automobile manufacturer, however, is now buying tube control for use with spot welding of duraluminum bodies in an effort to reduce weight.

Gas welding and cutting is used in same manner as here except that little acetylene is consumed. Ordinary coal gas and manufactured gas is much cheaper and so is generally employed.

London has included welding in its building code as being permissable for structural work. In fact some submarines have been built of welded plates in England.

In the following discussion, E. Reed, American Rolling Mill Co., pointed out that welding in steel plants is accepted as good practice since it makes possible the piping of oxygen and acetylene around the plant. Pipe welding is also accepted as the best practice. Welding also makes use of selected materials for special parts of equipment, reduces delays in mills and also, reduces stock of spare parts a plant needs to keep on hand.

Additional discussion compared welding practice in Europe to that in this country about four or five years ago. Possibly some of the popularity of alternating current welding is due to its being about 25 per cent faster for the inexperienced welder. Also a new man can learn this method about 25 per cent quicker, it was pointed out.

The statement was made that less than 5 per cent of rod used in America today is the old bare type, the large majority being fluxed.

A. E. Gibson, Wellman Engineering Co., Cleveland, said that his company is associated with an English manufacturing organization with whom they exchange ideas, one of the English engineers having visited Wellman Engineering Co. the first part of this year. Development of welding in heavy mechanical equipment has not been as great as in this country. The English appear


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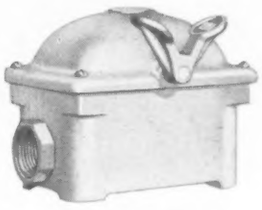
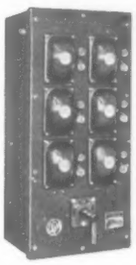


VAPOR-PROOF PUSH BUTTON



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to take little advantage of welding to replace cast pieces.

He also emphasized that profits today are made in the engineering department and not in the shop. Important savings are possible today by eliminating as much welding as possible in the design of welded constructions. The use of plate brakes and other forming equipment to reduce number and length of welds has great possibilities. He gave an example where they had been able to eliminate 80 per cent of the number of pieces required for oil tight, gear reduction cases and similar units by use of bending and forming equipment. Use of some 54½ lineal feet of bending on each unit saved cost of making a double fillet or butt weld in 54½ feet of ½-inch material, a tremendous cost advantage.

Mr. Gibson pointed out that companies doing welding should employ more jigs and fixtures in this work. It is not necessary to have large production of a welded item to make fixtures pay. He recommended development of some type of universal fixture for shop use, stating that suitable fixtures will cut fitup time as much as 75 per cent. Also the welding operator feels free to work much faster when all pieces are tightly positioned. Production trends today, said Mr. Gibson, are along these lines.

Mr. Jennings was asked about the substitution of welded construction for castings in Europe and he stated that he found very few castings being used. Two reasons for this was that it is difficult to get castings at all and when obtainable they are usually too poor to use. He mentioned no castings were employed in railway underframes or trucks, these being built up of rolled sections and plate. However, plate is predominately used instead of rolled sections as these latter are very hard to obtain.

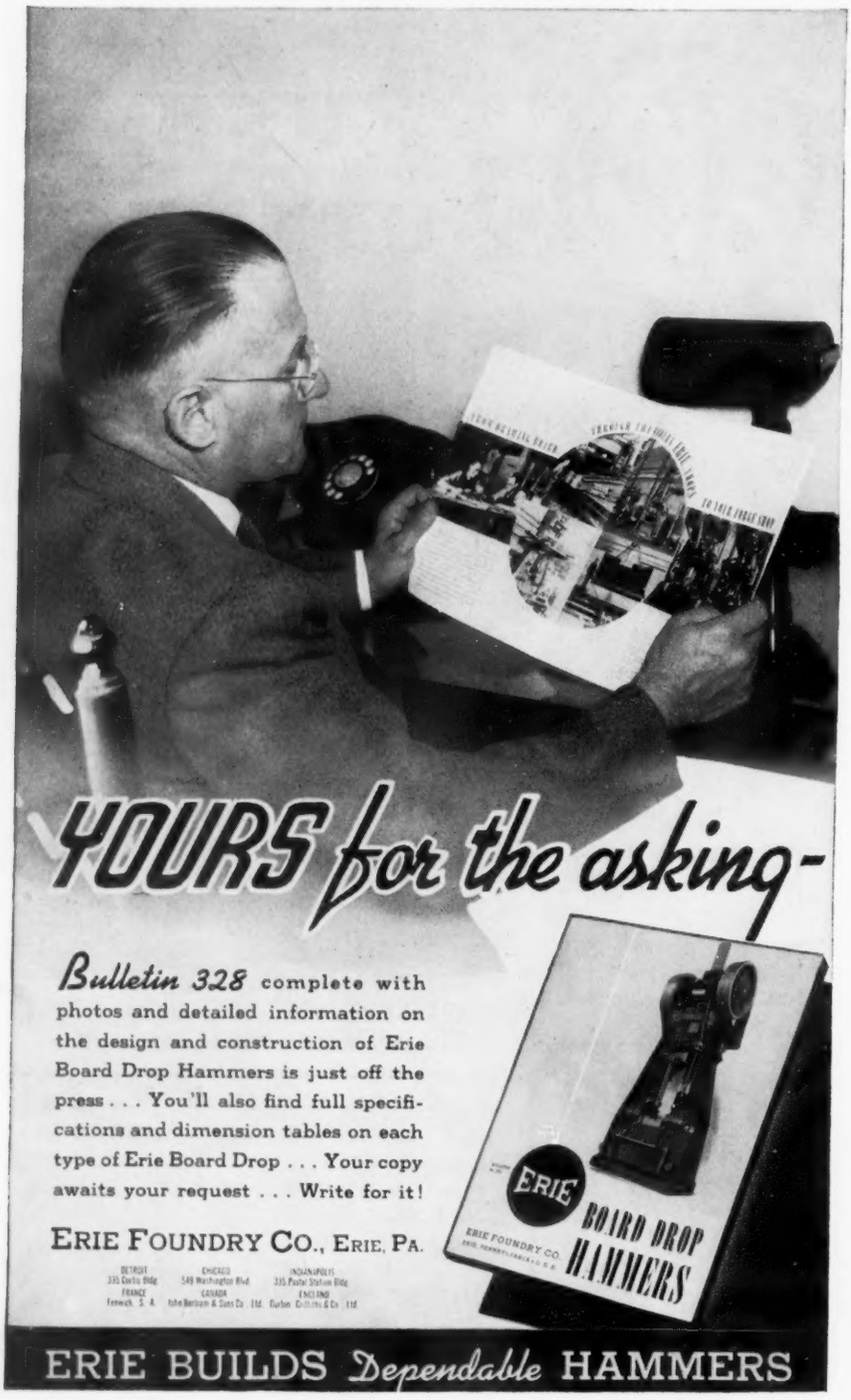
The second welding paper, "Welding as Used in Industrial Plants," was presented by Dr. Gilbert Doane, Lehigh university, Bethlehem, Pa. He pointed out that today there was a need to train men in engineering courses to take the responsibility of leadership. He reviewed welding progress and stated that until recently, there were just two main difficulties in welding—warping and shrinkage causing distortion and internal stresses, and the hardening of parent metal adjoining the weld.

### Welding Problems Solved

A new development largely obviating these difficulties is seen in the Union Melt or "smothered arc" process. Here a large amount of power is poured into a weld made underneath a blanket of powdered flux. Typical operating conditions in welding 1-inch plate using a slightly beveled butt joint are as follows: Automatic head feeds 5/16-inch wire, current is 1500 amperes, head moves 22 inches per minute, weld takes place under a 2-inch blanket of flux deposited just ahead of arc as head moves forward.

No spatter is produced and there is no visible heat. Slag chips off easily. Seam is smooth. No fumes are observable. Speed averages 40 times that of manual arc welding. Only one pass is required in welding plates up to 3 inches thick. There is no detectable warping or distortion. Sectioned and etched test specimens reveal a deep, narrow fusion zone with coarse "ingot structure." Tests show very little change in hardness in zone adjoining weld.

A limiting factor, however, is that all welds must be made in a straight line and in a downhand position. Circumferential joints in drums and tanks are welded by rotating under the head. Also, due to nature of equipment required, method is limited to shop use. The high speeds possible afford significant savings, speeds ranging up to 30 inches per minute (150 feet per hour) being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already obtained in buttwelding ¼-inch plate.

Questioned as to welding research, Dr. Doane told of experiments with underwater welding where absence of nitrogen should reduce age hardening if this factor is the cause of such difficulties. Attempting to weld in atmospheres of inert gases such as argon and helium fail because it is difficult to get an arc. Even if an arc is formed, no crater results and the globules of metal are not shot off of the electrode but drip off. In a vacuum, discharge effects take place with little or no arcing. Thus characteristics of arc vary widely under differing conditions. Research may some day open up remarkable improvements.

Asked if grain structures of welds produced by the smothered arc process were satisfactory, Dr. Doane advised that they met all code requirements and also those for pressure vessels.

**Presents Paper on Pickling**

Simultaneously with the welding session, H. W. Neblett, Inland Steel Co., East Chicago, Ind., presented his paper, "Electrolytic Pickling of Strip Steel," at the metallurgical session.

In the installation described, a continuous pickling line employs a series of four tanks, each tank about 60 feet long. Since electrolytic action is most pronounced after the acid has penetrated the steel, the first tank is used as a conditioning tank and electrolytic equipment installed in tanks two and three. Since about 98 per cent of the scale is removed in the two electrolytic tanks, the fourth tank is employed only as a cleanup unit. Details of the design and application of the electrolytic apparatus were given.

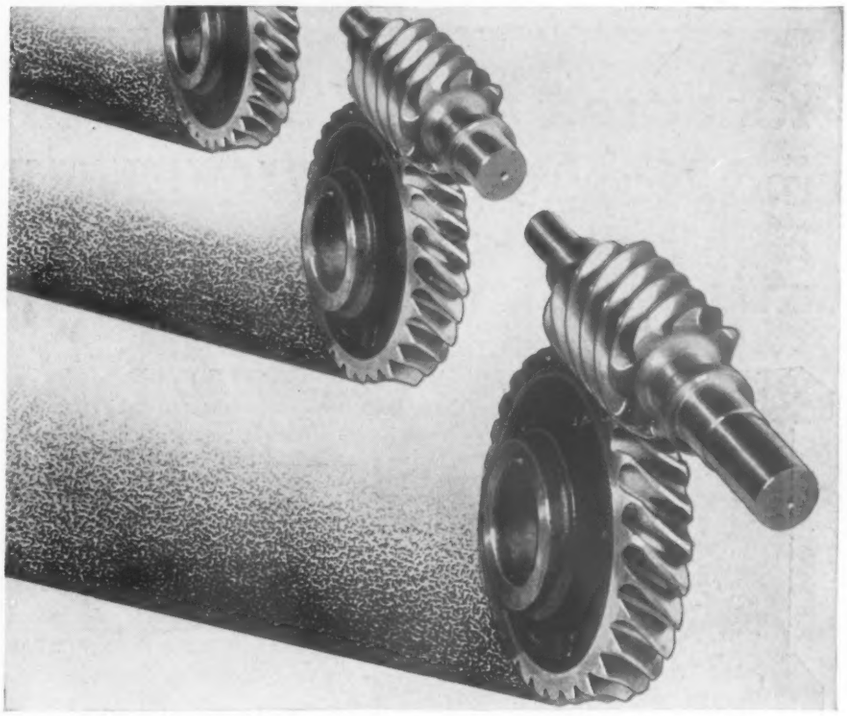
The equipment has been used since 1934, mostly on tin plate in coils from 300 to 360 feet long. Time required to handle a coil at the feed end, including shearing, welding and trimming, averages 1½ minutes with a maximum of 2 minutes. Before installation of electrolytic pickling equipment, strip speed ranged from 70 to 90 feet per minute. Speed range now is 120 to 170 feet with an average of 150 feet per minute.

C. E. Brown, Jones & Laughlin Steel Corp., Aliquippa, Pa., in discussing Mr. Neblett's paper pointed out that many improvements in rolling, treating and finishing steel have been made but few in the line of fundamental pickling practice. He cited a gain in the use of alternating current over direct current in electrolytic pickling of strip.

Neil Ranney, Wean Engineering Co. Inc., Warren, O., stressed the fact that output can be increased by electrolytic pickling. He emphasized that alternating current should be used in preference to direct current. Speed through the pickling lines, he stated, depends upon the type of equipment used. He mentioned a speed of 240 feet per minute, dependent upon the composition of scale on the steel. He announced that production through pickling tanks has been doubled and cost of this treatment reduced in recent years with further improvement expected.

In presenting a brief review of the electrical apparatus involved in this pickling line, R. M. Bayles, Westinghouse Electric & Mfg. Co., Chicago, stated that two transformers are used per tank and that taps for 7, 9, 11, 13 and 15 volts are available.

H. W. Hooker Jr., Hooker Electrochemical Co., Niagara Falls, N. Y., in describing an electrolytic alkaline cleaning method pointed out many features in common with electrolytic pickling practice. He cited a similarity in current densities ranging from 100 to 150 amperes per square foot. The process employed direct current and a solution of caustic soda. Among the advantages cited by the speaker were speed in metal cleaning, elimination of acid baths, tanks can be dumped in any

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sewer, no fumes, no neutralizing necessary and no over-pickling.

H. P. Munger, Republic Steel Corp., Warren, O., in presenting his paper, "Pickling of Strip Steel From the Metallurgical Point of View," said investigation of the scale formed on hot worked steel had shown it to consist of several layers of iron oxide formed by counter-current diffusion of iron and oxygen at the steel's surface. Outer and middle layer consist principally of ferric oxide and ferrous oxide, respectively, and the layer next to the base metal approximates iron oxide.

Since iron oxide decomposes into iron and ferrous oxide below 1065 degrees Fahr., nature of the heat treatment has been found to have a considerable bearing on pickling rate. Considering the free energies of the various reactions including iron and iron oxides in the presence of acid, for standard state conditions the electromotive potential of the iron and ferrous oxide reaction in the presence of acid is comparatively large. This reaction is the most probable one to take place in pickling. Thus by controlling scale formation, it is possible to minimize the pickling required.

Pressure resulting from surface tension of small bubbles of atomic hydrogen diffused into the metal under pressure was named as the cause of blistering. Atomic gas diffusing into the steel meets a discontinuity in the base metal, such as an inclusion, forms molecular hydrogen and raises a blister. Since inhibitors decrease the evolution of hydrogen, they also decrease the formation of blisters, it was stated.

When the scale is cracked on steel to be pickled, the steel is usually etched along these cracks. Inhibitors will not eliminate this type of etching action, it was pointed out.

First paper at the mechanical engineering session Wednesday morning was "Finishing Equipment for Wide Strip Mills," presented by John L. Young, United Engineering & Foundry Co., Pittsburgh. More exacting demands have resulted in considerable study being given the cold mill, in turn giving marked improvements. Attention was called to the fact that operators have more technical training than formerly, largely because of the increased emphasis placed on the personnel of cold finishing mills.

Discussing strip welders, Mr. Young said gas welders apparently made the best commercial weld. However, the automatic gas welder requires from 3 to 6 minutes per weld against 1¼ to 3 minutes for the electric flash welder, an important factor in speed of a processing line, such as a continuous pickler.

**Automatic Welding Favored**

There is a tendency toward completely automatic welding. Equipment is now in use which clamps the strip ends, shears and welds them—all without reclamping. Flash welds are trimmed and flattened between rolls while automatic gas welds are soft and require neither trimming or flattening.

Belt wrappers are another late improvement in cold mills. These now are capable of handling 20 gage strip up to 77 inches wide and 14 gage up to 48 inches in width. One mill showed a 15 per cent increase in production after installation of wrapper.

In electrolytic cleaning, speeds from 500 to 1500 feet per minute are possible using an improved method of conducting the current to the strip which enables voltage and current to be stepped up.

Use of Ward-Leonard control for synchronization of delivery end equipment and tension rolls makes new high speeds possible, he said.

A new continuous pickler drives the strip feeder by a chain which also carries broken strip ends through the grids if a break occurs thus preventing a break tying up the pickler.

Another pickler handles strip up


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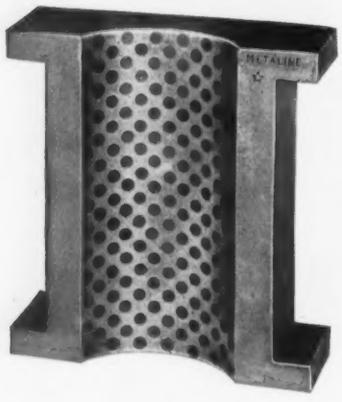


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to 24 inches wide and is a single strand continuous type using a new corkscrew design which makes possible a compact unit. With a welder in the front, it only occupies a space 70 x 25 feet. It handles strip 6 to 14 inches in width at a speed of 150 feet per minute.

Mr. Young noted a trend to composite metals and mentioned that it is possible to clad a ton of steel with only 40 pounds of 18-8 stainless alloy. Such material may eventually replace tin plate and galvanized plate, he added.

Some development work is being done on a spot welder to fasten inner and outer wraps on coils, a possible saving in time and convenience in handling to result.

**Flexibility Necessary**

R. J. Wean, Wean Engineering Co., Warren, O., stated that today flexibility in finishing equipment is most necessary to accommodate the wide variety of orders and to produce a maximum output through a wide range of operations. He mentioned a draw cut shaper permitting trimming of welds to actual sheet thickness and pointed out that welds need not always be annealed. Diagonal welds are of little advantage if the weld is trimmed down, he said.

Flying shears are now capable of operating at 500 to 600 feet per minute on tin plate and other thin sheet, cutting lengths accurate within 1/64 of an inch.

In annealing equipment, Mr. Wean predicted continuous annealing furnaces would increase in popularity due to their produce being uniform from edge to edge and from end to end, predetermination of results, shorter time, etc.

According to Mr. Wean, it is possible to apply a satisfactory zinc coating using only ½-pound of material per base box. Application of coatings will shortly be done on a continuous basis instead of sheet by sheet as at present.

In presenting the next paper, "Modern Blooming Mill Design," Lorenz Iversen, Mesta Machine Co., Pittsburgh, discussed new modifications in mill design and pointed out the advantages of the slabbing blooming mill over the conventional universal slabbing mill. Typical illustrations of existing mills were discussed and various features detailed, including methods of handling crops and scale.

One installation using a 2-high reversing mill turns the ingots for edging on horizontal rolls which permits reducing to any slab widths and thus reduces the number of ingot mold sizes necessary.

Following this paper, the session chairman, J. A. Clauss, Great Lakes Steel Corp., Ecorse, Mich., suggested


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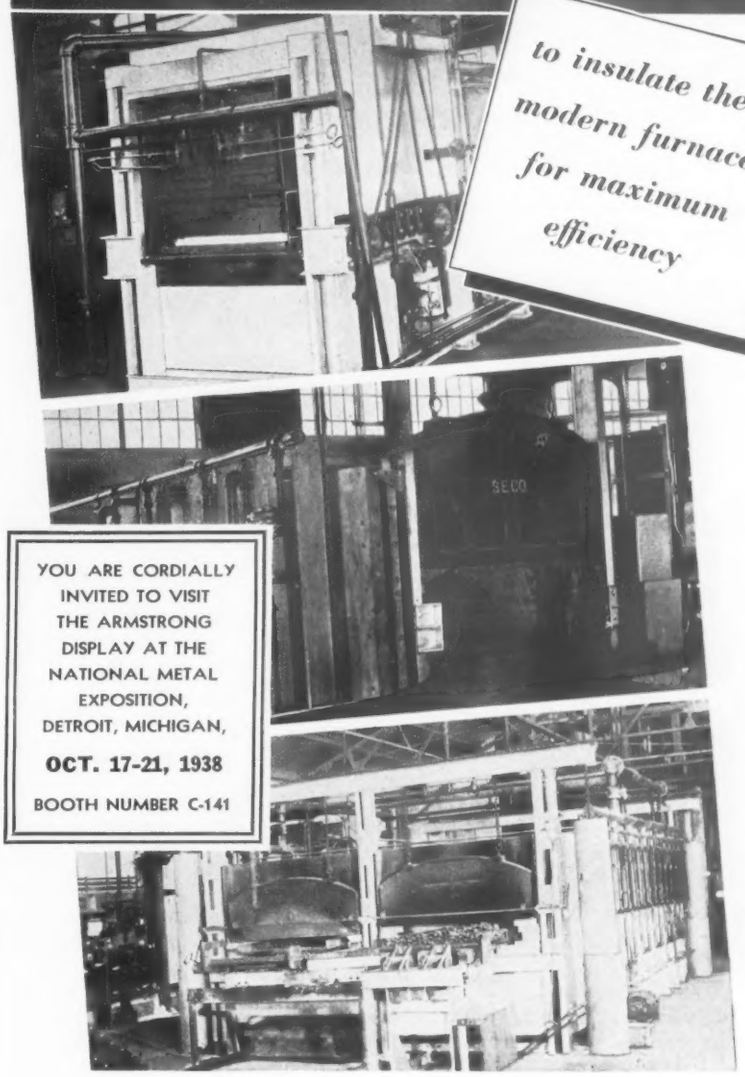


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that papers by mill engineers on handling of scale, cooling water requirements, sewer sizes, mill foundations, piping, etc., would be very worthwhile.

The third paper, "Brief Review of Developments in the Flat Rolling of Steel," by Stephen Badlam, consulting engineer, Pittsburgh, gave a complete historic account of rolling mill installations, especially covering those of recent date, comparing them as to size, output and similarity of design.

The first paper at the electrical engineering session Thursday, "Acceleration of Tandem Cold Strip Mills," was read by T. R. Rhea, General Electric Co. In it, a detailed study of accelerating conditions was presented with special emphasis on the causes of tension variations, since this is an important factor determining gage.

The paper presented methods of calculating strip changes and methods of their control. The mathematical solution assumed that the applied voltage during acceleration varied uniformly, that field excitation remains constant at value set for running condition, and that rolling torque for each stand remains constant. However, during the paper's subsequent discussion, it was pointed out that this last assumption was probably in error.

Variations in tension during acceleration are due to unequal inertias and unequal motor armature resistance, said Mr. Rhea, adding that a theoretical balance between these two factors is possible for only one rolling schedule.

Present practice is to control tension by employing automatic motor current control, automatic tension indicators and control, etc. The authors believed use of current regulators not justified but recommended selection of motors to meet expected load instead of using duplicate motors, adjustment of total armature resistance of each motor so total drop is about same for each motor, selection of motors having as low value of inertia as possible, use of tension indicating devices between stands, also use of some form of easily adjustable compounding.

### Mill Speed Discussed

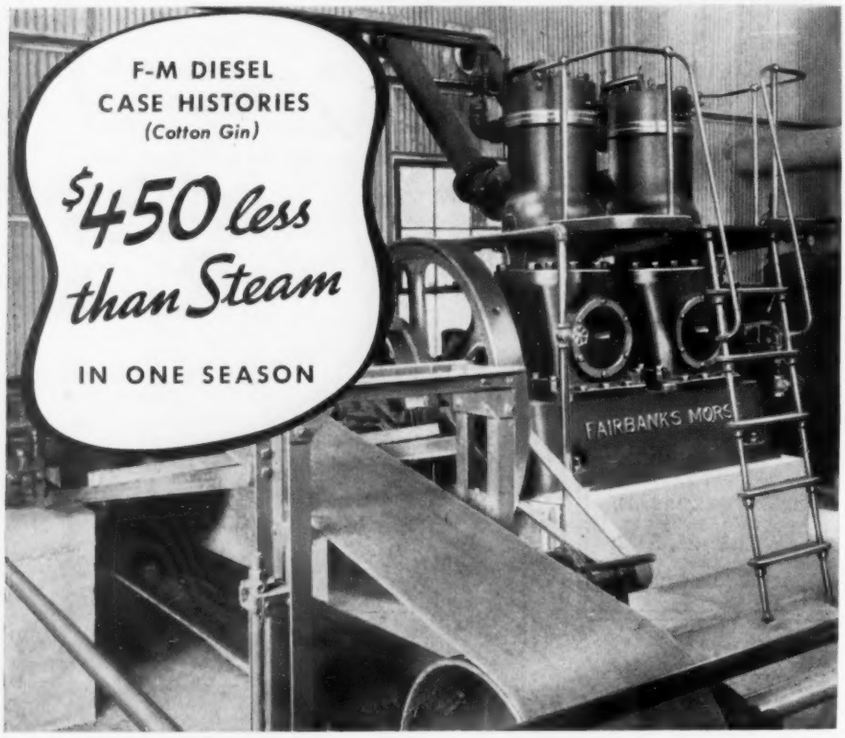
F. O. Schnure, Bethlehem Steel Co., Sparrows Point, Md., in commenting on the paper inquired as to proper speed for a 5-stand tandem cold mill and said that on a particular installation it would require a 38 per cent increase in motor capacity to obtain a 11 per cent increase in tonnage, apparently not justified. Reply was that the economics of course always determined the proper speed.

Also it was emphasized that more work needed to be done to reduce amount of off-gage material at beginning and end of a coil. One solution is to join coils together making fewer ends. Another possibility is to adjust screwdowns during acceleration.

The paper, "Low Voltage Rectifiers for Industrial Requirements," read by G. E. Stoltz, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., detailed operation and application of the new Ignitron type of mercury arc rectifier tube equipment. Such equipment now has developed to the point where it is entirely dependable and where it should be considered by steel engineers, said Mr. Stoltz.

Because of the high cost of interruptions in steel mills, it was suggested that best place to try out this equipment would be on 250-volt auxiliary services rather than on main drives.

Improvement in efficiency is reason for present interest in mercury arc rectifiers. Ignitron type reduces arc drop to about 15 to 18 volts compared with 20 to 30 volts previously experienced. This means efficiency of the new equipment is raised to a point where it is higher than obtained with mo-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tor-generator sets even at 250 volts. On 600-volt services, efficiencies of Ignitron rectifiers lie well above those of even the synchronous converter. Efficiency of 92 per cent at 250 volts was given the Ignitron rectifier.

Also it was pointed out that eventually this equipment may even be substituted for variable voltage equipment, as this was possible.

### Discusses Oil Burners

A. J. Fisher, fuel engineer, Bethlehem Steel Co., Sparrows Point, Md., in speaking on "Oil Burning and Its Control" traced the early development of oil burners from the nineteenth century. In describing the design of furnace and oil burning equipment he emphasized that well trained instrument men should visit the furnaces each day and make any adjustments that are necessary to eliminate combustion difficulties. The speaker described various types of oil conditioning systems and controls.

E. Kraber, vice president, York Oil Burner Co., York, Pa., described the Iris-type shutter which permits a wide range of low gas pressures to be used.

O. F. Campbell, Sinclair Refining Co., in discussing Mr. Fisher's paper stated that in his opinion control by automatic equipment can be carried too far. It must be used with discretion he stated, and the proper adjustments made because of ever-present fire hazards. He took exception to the usual practice of atomizing fuel oil with steam and recommended that mechanical means be employed for intimately mixing fuel oil and air.

Clark Johnson, manager, gear department, United Engineering & Foundry Co., Pittsburgh, in speaking on "Design and Lubrication of Gears and Pinions," stressed the importance of complete tooth contact and hardness of gears.

L. F. Coffin, superintendent, mechanical department, Bethlehem Steel Co., Sparrows Point, Md., in discussing this paper mentioned that pinions for mill drives now are being manufactured case hardened as large as 24 inches diameter. The speaker was of the opinion that gears should be lapped in the field.

A paper on "Lubrication Problems of Modern Continuous Rolling Mills" by L. Ballard, supervising industrial engineer, Tide Water Associated Oil Co., New York, stressed the importance of design in relation to lubrication.

Consensus of opinion advanced in the discussion of this paper was that better shields for bearings are necessary, particularly in steel mill equipment. That the industry is in need of better compounded oils was the opinion of many speakers.


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1—No. 4 Beaman Smith
1—No. 2 Beaman Smith

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1—Ball Facing machine
1—Barret 3-way valve facing

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1—Pittsburgh Dry Tool grinder
1—Cincinnati No. 1 Universal cutter and grinder
1—Brown & Sharpe No. 3 Universal cylindrical grinder
1—Oliver No. 5 twist drill
1—Sellers No. 1 Universal grinder
1—6 spindle automatic grinder

**SLOTTERS**
1—Dill Slotter

**BOLT & PIPE THREADING MACHINES**
1—Acme 2" double head bolt threader
1—Acme 3" single head bolt threader
1—Acme 3½" single head bolt threader
1—Landis 2" Pipe threader
1—Landis 4" Pipe threader
1—Landis 6" Pipe threader
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1—6' Prentice
1—7' Fosdick
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1—4' Prentice
1—5' Prentice
2—6' Prentice
1—4' Bement
2—5' Bement
1—3' Carlton
1—40" Bement
1—20" Barnes

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2—Bausch 16 spindles
2—Bausch 8 spindles

**TAPPING MACHINES**
1—Baker 16" Vertical
1—Exeter 12" Vertical
1—Baker 4" Vertical
1—Exeter 6" Vertical
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## Spotwelding Aircraft

(*Continued from Page* 94)

countered it was necessary to redesign the fixtures for the resistance welder to make them more or less universal. The upper arm was made of aluminum for light weight but in the salt atmosphere of San Diego an electrolytic action was set up with the junction of the copper electrodes causing poor conductivity and arcing at the connection. End of upper arm was removed and supplanted with a trunnion arrangement and a 1 x 4-inch copper conductor to the transformer connection. The trunnion, Fig. 1, gave an arc adjustment and was free enough to permit some lateral motion.

The electrode holder and tools were made of copper castings with a 1¾-inch diameter shank 2 inches long to fit in the trunnion and secured in place with bolt pulling the tool tightly to the face of connection. Using a round shank permits rotating the holder, giving freedom for adjustment in all planes. These tools, Fig. 2, are also interchangeable with the bottom arm which has adjustment in and out to compensate for difference in length of the tools. Most welding machines have fixed arms and are impractical for aircraft production. Having the tools adjustable and interchangeable cuts tooling costs and fewer tools are needed to handle the parts spotwelded.

(*Concluded next week*)

♦

## Legal Status of Trade Associations Analyzed

■ *Trade Associations in Law and Business*, by Benjamin S. Kirsh and Harold R. Shapiro; paper, 399 pages, 6 x 9 inches; published by Central Book Co., New York; supplied by STEEL, Cleveland, for $5; in Europe by Penton Publishing Co. Ltd., Caxton House, Westminster, London, S. W. 1.

In this volume are presented annotated, up-to-date analyses and interpretations of antitrust laws, decisions, law review articles, discussions in economic and business journals and government documents.

It is a critique of the strength and weaknesses of the trade association movement, pointing out in what respects their activities are socially beneficial or hostile to public welfare. It describes how judicial findings have delimited rightful and wrongful actions of business groups in their concerted functions.

While recently enacted statutes, such as the Robinson-Patman act, are aimed at regulation of individual competitive activity, they also affect trade associations at some points. They also point the trend of law and the practice of co-operative activity.

The analysis of business and legal problems encountered in trade association work makes the volume valuable to association and business executives, counsel, advisors and students, especially in view of the current investigations into monopolies by the temporary national economic committee, recently formed by the President.

## Eliminates Use of Ink In Recording Instrument

■ A mechanism using a typewriter ribbon as the marking medium has been developed by General Electric Co., Schenectady, N. Y., for use with recording instruments. Advantages include elimination of spillage evaporation, freezing and clogging of pens. Mechanism is said to be reliable over a wide temperature range, operating successfully in temperatures as low as -10 degrees Fahr. Reduction of pen-to-paper friction insures higher accuracy in recording. The stylus, striking ribbon four times per second, forms a continuous record at all standard chart speeds.


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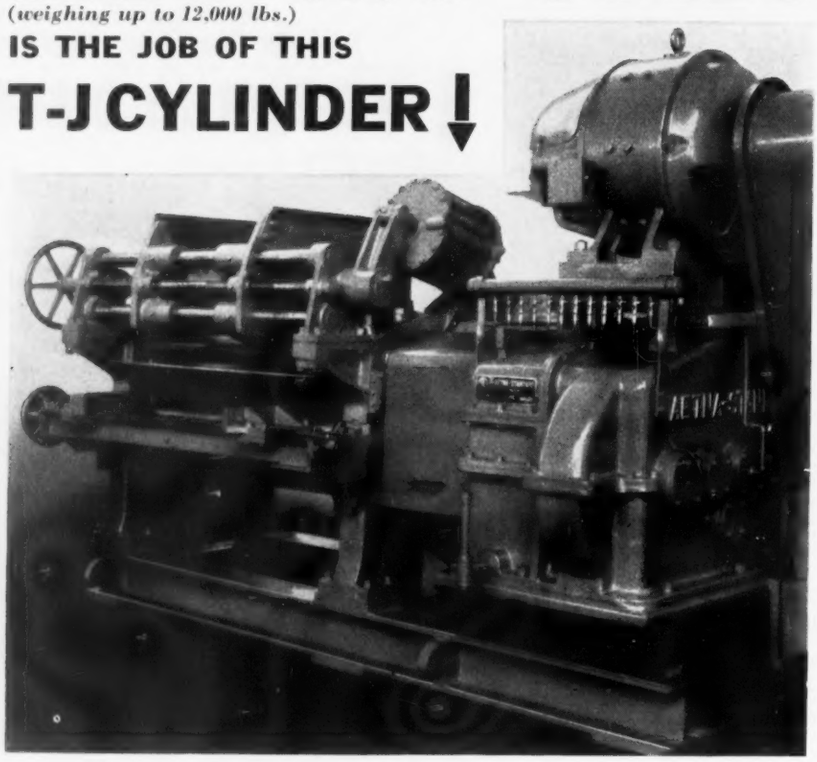

AETNA STANDARD ROLL TYPE COILER

As the strip is completely coiled it must be discharged from the carrier rolls to a conveyor. Kickout fingers are provided which are operated by the air cylinder. The fingers raise the coil and push it forward where it then rolls forward onto the conveyor.

A Cylinder to handle this job (note that the cylinder motion rotates a shaft to which the fingers are keyed) must incorporate features which count for service. The type of service that you need on your machines. These "service" features control the design of T-J CYLINDERS. Write to us for your copy of our catalog No. 36 which gives specifications.

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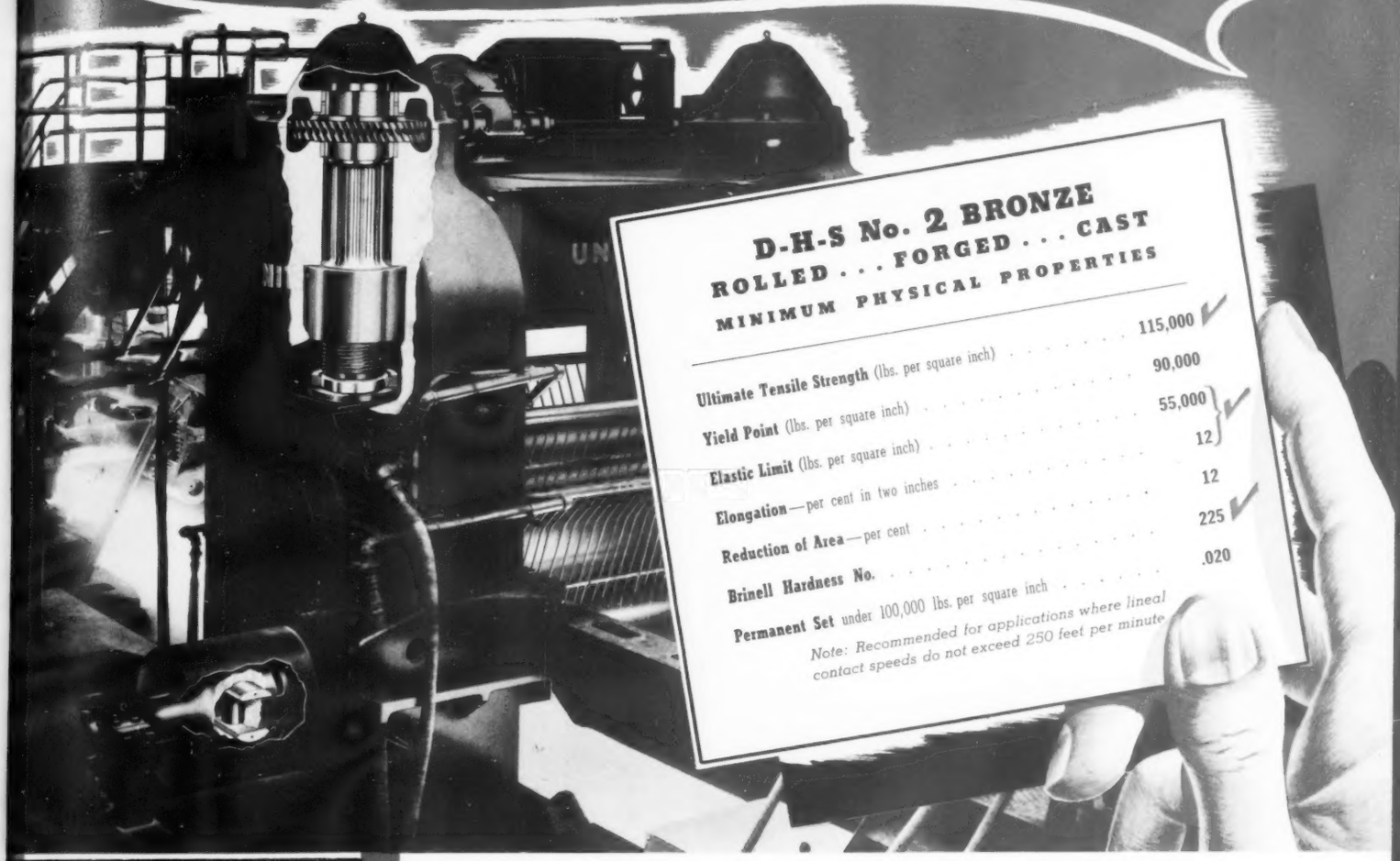
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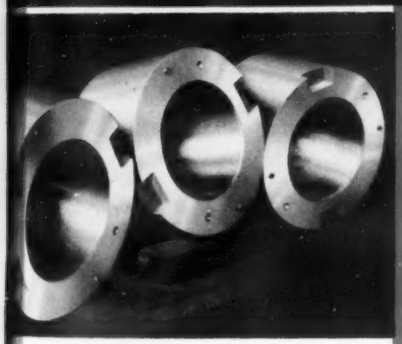
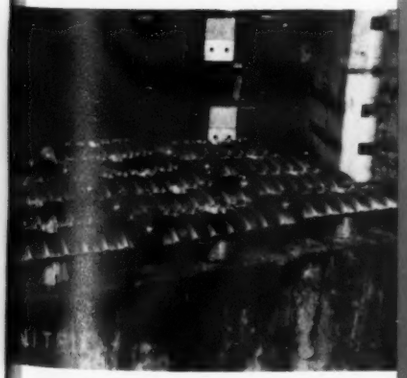
Yield Point (lbs. per square inch) 90,000
Elastic Limit (lbs. per square inch) 55,000
Elongation—per cent in two inches 12
Reduction of Area—per cent 12
Brinell Hardness No. 225
Permanent Set under 100,000 lbs. per square inch .020
Note: Recommended for applications where lineal contact speeds do not exceed 250 feet per minute



Typical D-H-S #2 Bronze Screw Boxes for the Mill illustrated above. Each is 28″ in diameter x 19″, and weighs 2175 pounds.



Some of the D-H-S #2 Bronze Slippers used in this Strip Mill.

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The superior balance of physical properties, the great strength in compression, and the ability of the material to stand the punishment involved in modern steel mill service, give the assurance of complete dependability that is vital to continuous operation. D-H-S #2 Bronze is serving in steel mills the world over. Especially recommended for Slippers, Segments, Worm Gears, Mixer Nuts, Screw-Down Nuts, Housing Nuts, and Slab Pusher Nuts.

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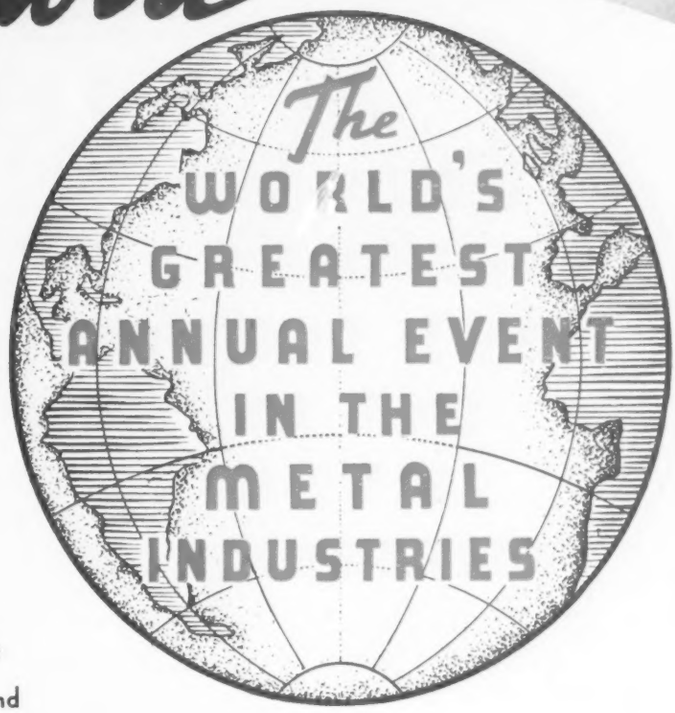


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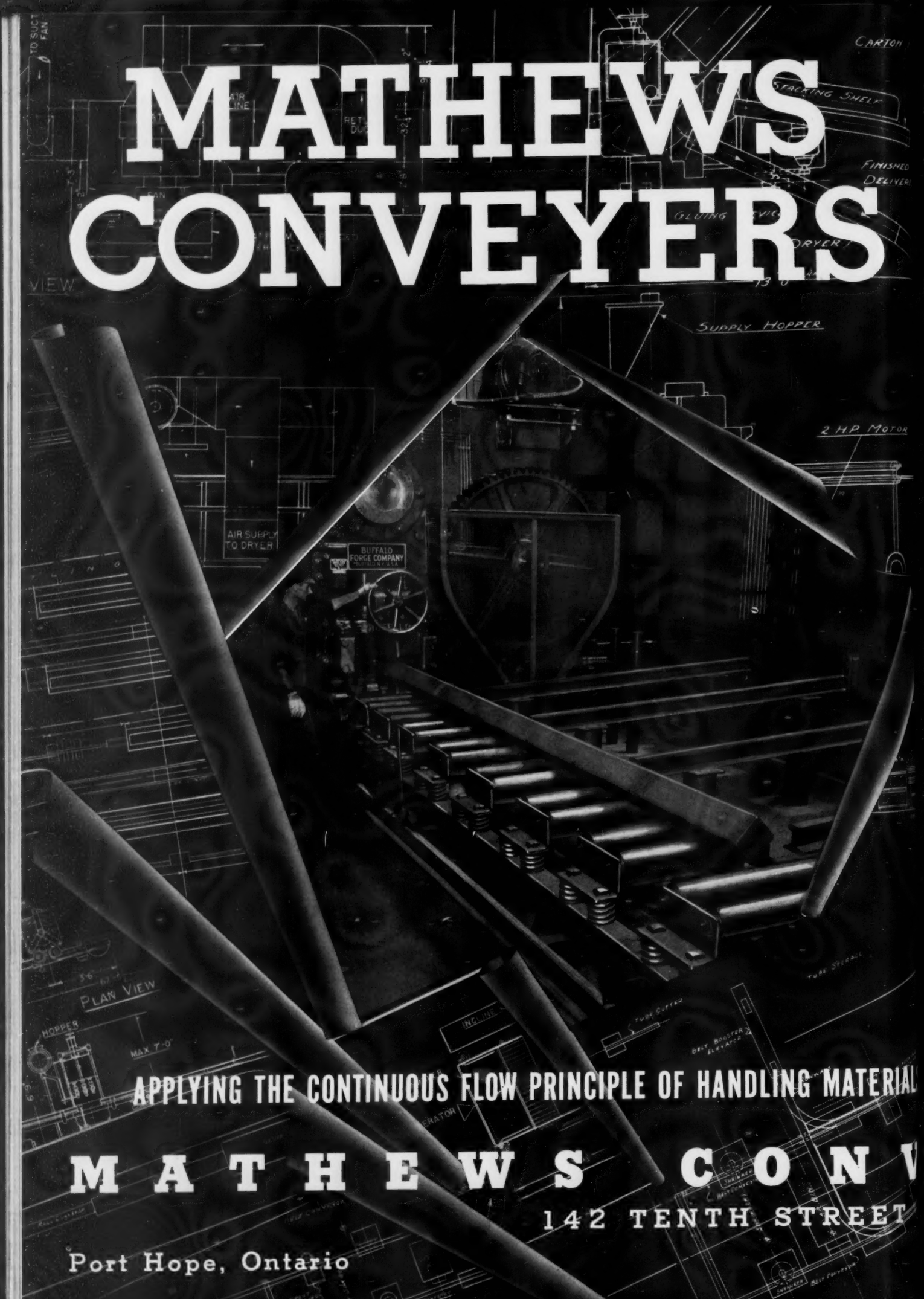
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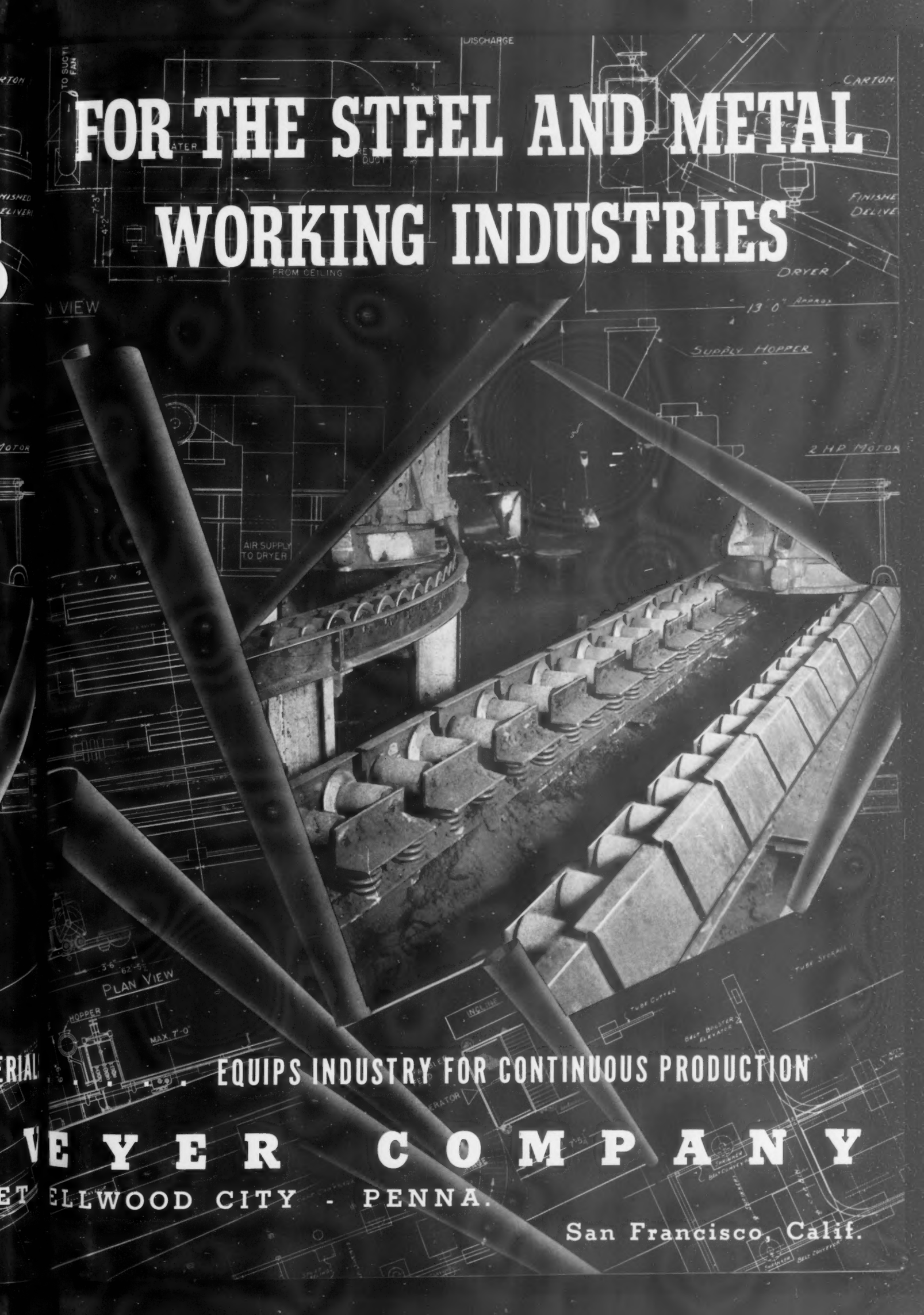


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# NATIONAL METAL CONGRESS

SUPPLEMENT TO

STEEL

OCTOBER 10, 1938

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# Detroit

## . . . Hub of Motordom ready for Metal Congress and Show

■ THE HUM of Detroit's automobile assembly lines as they roll off 1939 models at a rapid clip will supply a harmonious accompaniment for the Twentieth Annual National Metal Congress and Exposition in the Motor City, Oct. 17-21. Following a year of disappointing and discouraging operations, the present expanded activity of the district's plants provides a welcome setting for the year's outstanding event of the metals industry.

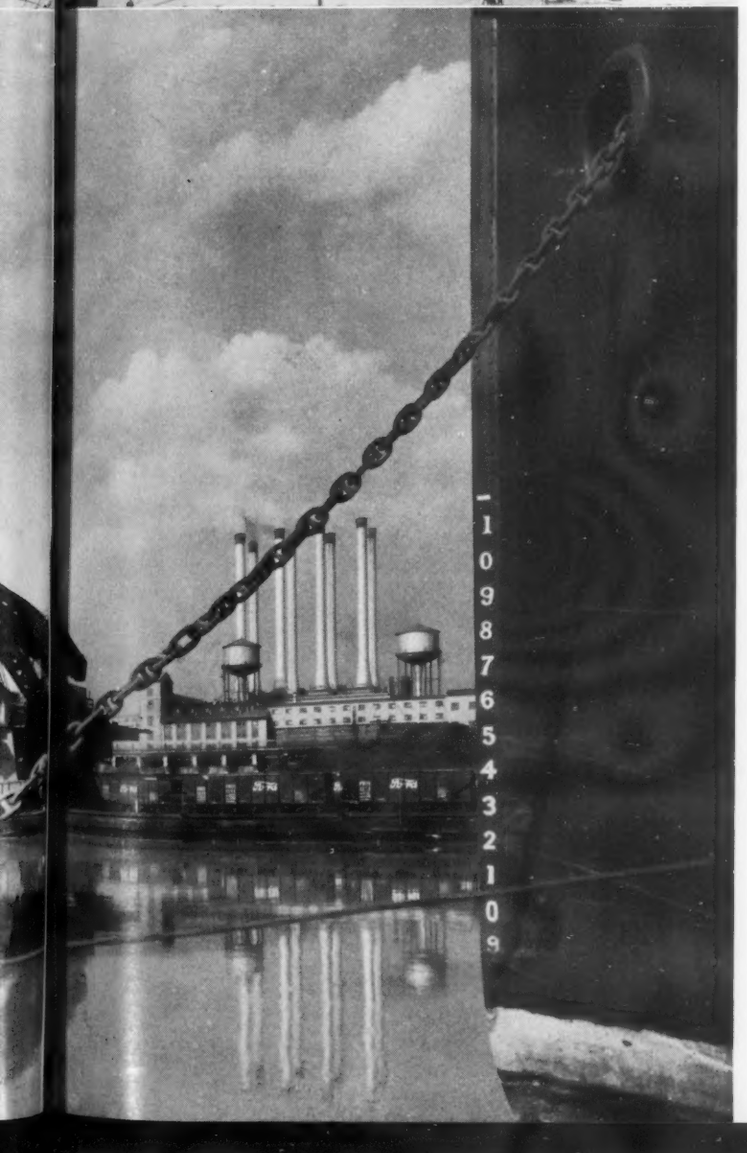
Detroit officiates as host to this important gathering for the fourth time in 17 years, this city having accommodated the congress and show in 1922, 1927 and 1933. Attendance this year, as in the past, will include several thousand executives, metallurgists, engineers and technicians from all parts of the United States, Canada, and a few European countries. Although Detroit industry is predominantly motor car manufacture, the tremendous plants of automobile makers and smaller shops producing materials, parts and accessories, afford a broad range of metalworking operations. Many of these plants will be open to visitors through the week.

American Society for Metals is the chief sponsor and originator of the congress. Technical organizations co-operating with it will be the American Welding Society, American Institute of Mining and Metallurgical Engineers, and the Wire Association.

The exposition, in Convention Hall, will be the largest in recent years. Exhibitors will total approximately 230, about the same as last year in Atlantic City, but individual allotments of floor space are 20 per cent larger. Exhibit space will aggregate over 80,000 square feet.

Hotel Statler will be headquarters for the American Society for Metals and all morning sessions during the five days will be conducted there. Afternoon sessions will be at Convention Hall. A total of 40 papers will be presented at 13 sessions. A feature of the program will be a three-session symposium on hardenability of steels. Two educational courses are scheduled, one of five lectures on machinability and the other of three lectures on pyrometry.

Annual business meeting, with election of officers,



will take place on Wednesday morning, to be followed by the annual Campbell Memorial lecture by A. L. Boegehold, General Motors Corp., Detroit. The banquet will be served Thursday evening.

American Welding Society holds its nineteenth annual meeting at the Book-Cadillac hotel, activities extending over five days. Thirteen sessions, two running simultaneously during several periods, schedule 47 papers. One session will be conducted jointly with the American Society of Mechanical Engineers. Recipients of the Miller and Lincoln medals will be announced at the opening session; the business meeting and election of officers will be conducted Friday morning. The banquet will be served Thursday evening.

Participation of the American Institute of Mining and Metallurgical Engineers will comprise fall meetings of its Institute of Metals and Iron and Steel divisions extending over three days of the week at the Book-Cadillac hotel. The program schedules nine sessions, five for the former division and four for the latter, with 28 papers. Members of the two divisions will attend the annual dinner jointly on Wednesday evening.

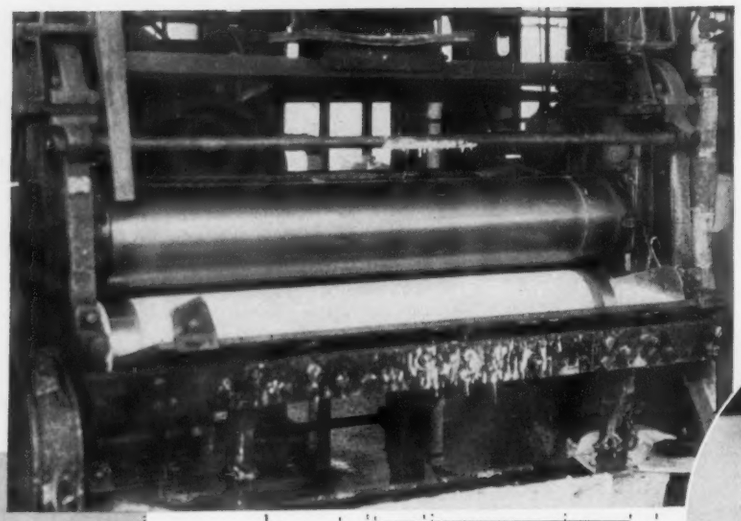
Annual meeting of the Wire Association will be conducted at the Detroit-Leland hotel, Monday through Thursday. The program provides eight sessions, five sponsored by the Steel division, two by the Nonferrous division, and one participated in jointly, with a total of 16 papers. A symposium on acid disposal will feature the joint session. Other features are a luncheon Wednesday noon, the business meeting in the afternoon and dinner in the evening.

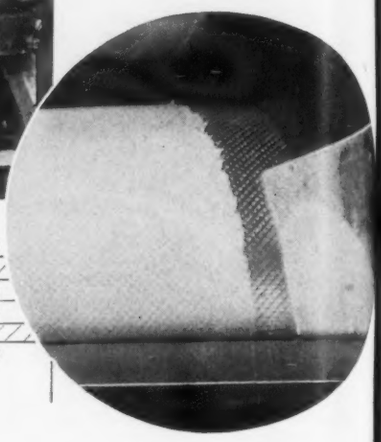
DESPITE the fact that the metalworking industry hit the toboggan shortly after the 1937 Metal congress and show and only of late has experienced improvement in activity, the year has been marked with many new and important developments in metals and processes for their fabrication and treatment. Lifting of pressure from production schedules permitted research to look forward and to explore promising fields.

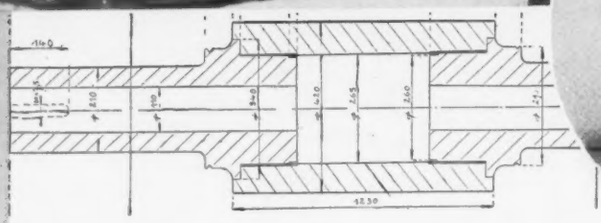
With a view to apprising its readers of recent accomplishments and what the future holds in store, STEEL devotes a number of succeeding pages to a review of the past year. Statements of progress contributed by 33 authorities in the fields of metals, heat treating, welding and wiremaking introduce this section. These are followed by several pages showing pictorially a few of the notable developments in the fabrication and use of metals.

■ **Detroit's Cadillac Square and the City Hall are set off by numerous skyscrapers in the downtown financial district, as shown in the illustration above. Freighters, ore and coal are an integral part of the vast River Rouge plant of the Ford Motor Co., shown below. Large lake boats come to the very back door of the plant to be unloaded**

# ...the hardest known







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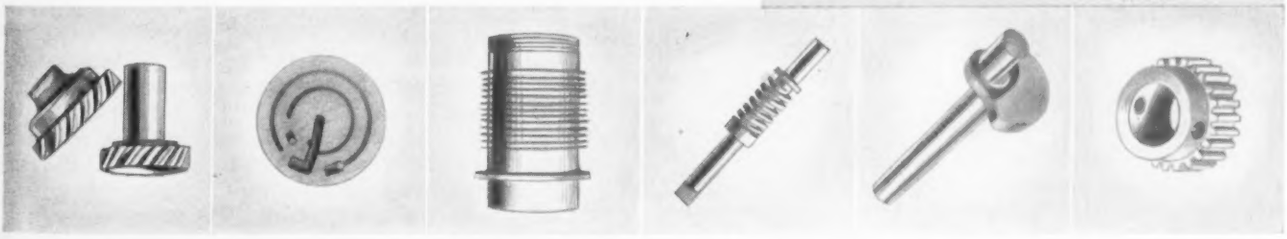

...Y CORPORATION 230 PARK AVE. NEW YORK, N. Y.

# Scanning the ... in Metals, Their T...

## New Steels Engineered To Meet Specific Needs

BY FREDERICK D. FOOTE

Partner,
Saklatwalla & Foote, New York

■ METALLURGICAL advancement has been profoundly affected by an improved relationship now existing between steel companies and their customers. Heavy tonnage producers are becoming conscious of the market-building possibilities of research. Not long ago the attention of their technicians was focused chiefly upon the control and perfection of quality in a few well established grades of structural steel. Today they are in close touch with the aims of engineers, designers and builders, and so have obtained a better knowledge of the service required of their products.

The upshot is a rapidly expanding group of new and improved steels having special and various properties which, it is important to point out, are adapted to modern welding processes, combine a high degree of useful strength with full ductility, and are used in the as-rolled condition. From these steels the ones possessing the most suitable characteristics for the component parts of structures may be selected. This close co-operation has been so effective that many structures believed to be efficient yesterday are outmoded today.

A painstaking inquiry has been conducted into the behavior of alloying elements in scores of new combinations. Interesting discoveries have resulted concerning the critical effects of the improper balancing of certain elements when in combination with others. Moreover, some of them, until lately regarded as highly undesirable in metallurgy, have proven remarkably beneficial in producing improved properties at relatively low cost.

The favorable light in which phosphorus is now held is perhaps the most surprising example of this. Long avoided as a treacherous impurity—and properly so because of its bad influence as a residual element only— it is now utilized as an important inhibitor of various forms of corrosion. It also imparts greater strength to steel for a given cost than any other element. Other discoveries of a similar character point to the infinite possibilities of metallurgical and chemical combinations.

Removal of needless deadweight from all steel structures is a development of outstanding promise and commercial importance. Research in metallurgy and engineering has been given great impetus by the phenomenal strides already made in pursuit of this objective. In seeking the benefits of light weight in the design of structures, without sacrificing strength or service life, it is found that a high degree of resistance to atmospheric corrosion is frequently indispensable. Protective coatings and surface treatments alone have not proved adequate.

Until recently engineers had slight alternative but to increase the weight of structures well beyond strength requirements to provide against the weakening effects of corrosion and abrasion. Today, with welding technique reliably adapted to the work, and the stronger, more corrosion and abrasion-resistant steels available, this limitation no longer exists.

Present procedure is to select a steel for each individual part of a structure after a careful evaluation of its fitness to withstand the service to which the part is to be subjected. Thus, excessive weight, which has been such a substantial burden to the costs of industry and transportation, is avoided. A modern passenger train, for example, weighs one-third less than its predecessor, because of the proper distribution of scores of different materials in its construction, many of which were unavailable until recently. Modern freight cars weigh far less, are stronger, carry more payload, and their ultimate cost is less.

Reviews of metallurgical progress made of late and the gratifying results achieved through the introduction of new types of steel in modern design are impressive and of absorbing interest, but of greater significance, in broad terms, in the new con-

# Year's Progress in Treatment and Fabrication

ception of research that has made this rapid advancement possible. The opportunity is at hand to rebuild the structures of the world.

## Turn to Higher Carbon Steels for Forge Work

BY WALDEMAR NAUJOKS
Chief Engineer,
Steel Improvement & Forge Co., Cleveland

■ PROGRESS in use of forging metals during the past year has been not so much in development of new compositions as in greater recognition of the properties of many of the present materials. Among commercial carbon forging steels, the trend has been away from the low carbon steel, as S.A.E. 1020, to carbon steels of high carbon content, as S.A.E 1035 and 1040. This change is not that more strength is required for many of these forgings, but it has been recognized that the higher carbon steels machine easier and cleaner.

Chromium-molybdenum steels have been used to a greater extent and steels in the S.A.E. 4100 series have replaced other similar purpose compositions in many places. The principal reason is that steels in this series can be machined in the heat treated state at higher hardnesses than most of the similar purpose alloys.

Corrosion-resisting metals are finding increased use, and since machinery and equipment builders have learned to machine and finish these metals with greater ease, more uses have been found for them. The more complex stainless steels, using molybdenum, titanium, columbium, and other special purpose alloys, have not progressed much beyond the experimental stage for use in die production forgings as yet.

There seems to be a tendency toward use of copper alloys, such as the brasses and bronzes, for some of the less severe corrosive conditions.

A noticeable trend has been the demand for tested properties. Physical properties, as indicated from tensile tests, are required much more frequently, which seems to indicate that greater recognition has been given to the importance of actual physical properties in forged parts rather than assuming that a given chemical composition will necessarily impart desirable physicals.

## Trend Is Toward Light High-Strength Materials

BY BRADLEY STOUGHTON
Dean of Engineering,
Lehigh University, Bethlehem, Pa.

■ IF ONE can judge future trends by recent developments, we may expect to see early new progress in: Production of purer and more gas-free metals and cleaner steels; greater use of automatic control and scientific instruments for guiding furnace practice, rolling, heat treating, etc.; more light on properties of metals, especially on plastic flow and fatigue; additional markets for products of continuous mills; wider sheets, cheaper shapes and more extended use of welding to encourage use of steel in houses to counteract decreasing automobile demand for metals, which is now estimated to be only about one-half the producing capacity; and higher quality and cheaper processes which always follow periods of depression.

Among developments of the past year should be

mentioned the use of improved pyrometers and temperature control devices, including the phototube; manufacture of ring gears in centrifugal molds; wider use of induction heating for forging as well as localized hardening or annealing; and considerable new light on the making and properties of wire.

Competition to supply materials with high strength-weight factors for airplanes, high-speed trains, automobiles and even locomotives, as well as moving parts of machines, has led to development of lightweight nonferrous alloys of moderate strength, and heat treated steel alloys of greater strength. Progress has been made within 12 months in magnesium alloys, especially as regards corrosion in sea water. The sequence in strength-weight factors is now as follows: Cold drawn steel wire, heat treated high-alloy steels, magnesium alloy, aluminum alloy, and low-alloy steels. Comparatively low cost and easy treatment and fabrication favors low-alloy steels except where extremely high strength-weight factor is imperative.

One can harden a comparatively soft steel by such operations as carbon case hardening or nitriding, by inductive heating, or by applying hard alloys to certain localities. Advances have been made in welding hard alloys in place when high temperatures might injure the base metal. Local softening to remove strains from welding or the like, or for refining grain structure, is accomplished by a similar process known as flame softening.

Powder metallurgy is used to agglomerate under high pressure intimate mixtures of metals which will either not melt easily, not alloy together, lose their identity if highly heated, be agglomerated more economically than melted, or be less desirable in cast form. Molybdenum composites, tungsten-copper combinations, tantalum-carbide tools, permanent magnet alloys, porous bearing materials, are respectively examples of these five classes.

No metallurgical development of recent years has had a greater influence on design of machines and vehicles than improvement in making die castings, which, in turn, has resulted in part from long research in production of metals, especially zinc and aluminum of 99.99 per cent purity. Today as much as 100,000 tons of zinc are used in America per year in this art; even iron castings are made this way.

One of the accomplishments of the year is realization of the ideal that superior surface finish insures greater resistance to fatigue. Protection of surfaces against corrosion and corrosion-fatigue also has received attention.

## Seek To Improve Irons For Abrasion Resistance

BY V. A. CROSBY

Metallurgical Engineer,
Climax Molybdenum Co., Detroit

■ IN THE casting field of ferrous metallurgy, a great deal of work has been done during the past year on abrasion-resistant irons. This work has included both high and low carbon, as well as the various alloyed grades. The feeling has been and is today that much is desired in the way of improvement in this field of application.

One of the important compositions worthy of mention is the copper-chrome-manganese-molybdenum, low carbon (1.50-2.00 per cent) materials used with excellent success in mill liners, mill rolls, grinding plates, sand pump impellers, pump housings, brick box liners and plates. Hardness values of 500 to 600 seem to be more desirable than higher values where increased tendency to spall is encountered.

In the oil fields, the most notable development in materials during the last year seems to be the high molybdenum pump liners used in pumping mud for well drilling operation. The 8 per cent molybdenum liners have shown phenomenal life, lasting in some cases as much as five to eight times as long as carburized steel liners. Other liners of 4 per cent molybdenum and 2 per cent molybdenum, which are used when the service is less severe, have shown remarkable life.

The application of molybdenum in percentages up to 10 per cent for wheelabrator blades is said to have greatly increased the service life of the parts and in addition have actually proved advantageous economically.

Uncertainty of the tungsten market accelerated all efforts to establish another satisfactory element for the production of high speed steel. These efforts met with success when the commercial manufacturing and heat treating practices were established. The past year's production of molybdenum high speed steel has shown quite a considerable increase over the previous year and argues to increase utilizing, as it were, to a great extent the most abundant American alloying element suitable for high speed steel.

## Manganese May Be Basis For New Alloy Systems

BY A. ALLEN BATES

Manager, Chemical and Metallurgical Division,
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

■ THIS YEAR apparently has produced no single development of revolutionary caste. However, Dean's recent description of ductile, high-purity manganese presents an intriguing field for the metallurgical imagination. At present, engineering alloys of broad applicability are limited to the systems of which iron, aluminum and copper are the basic metals, although a second triad, magnesium, nickel and zinc, are indispensable and of increasing importance.

Manganese is a relatively abundant element and if, when of sufficient purity, manganese and its alloys prove to possess fair ductility, it is not impossible that it may increase by one our small number of base metals. The peculiar position of manganese in the periodic system and the complex atomic arrangement of the manganese crystal provide reasons equally good for hopeful enthusiasm or skepticism regarding the future of manganese, as the basis of new, industrial alloy systems.

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# RYERSON STEEL-SERVICE

chanical and chemical properties of zinc, iron, copper, aluminum and other metals, which has resulted from control of the last hundredth of a per cent of impurities, leads to high hopes for the greatly extended usefulness of magnesium. Corrosiveness has been a major problem in industrial application of this metal. Recent progress, however, in the production of extremely pure magnesium which exhibits greatly improved corrosion resistance is encouraging to those who believe that this naturally plentiful element eventually will be one of our most useful metals.

The foregoing is of interest to ferrous metallurgists, since by reasons of their natural abundance and their inherent physical properties magnesium, aluminum and manganese seem to be the only metals which can never seriously compete with iron for structural purposes.

The year has brought normal progress in the relatively newer metallurgical processes and techniques such as powder metallurgy, and the production of age hardenable, nonferrous alloys. The former has, in addition to its many other achievements, found a rapidly expanding application of great usefulness to the electrical industry for contact materials, magnets and conductors of unusual character.

It is difficult to predict eventual importance of newly announced theory. At present, no single achievement in theoretical metallurgy gives promise of attaining the wide acceptance and importance of, say, the reaction rate curve ("S-curve") brought out by Bain and Davenport several seasons ago. Incidentally, a study by Mehl and his co-workers, to be presented at the 1938 National Metals congress, throws new and helpful light on certain aspects of the S-curve.

The most striking, recent development in the realm of metallurgical theory has been the invasion by physicists. During 1937 and 1938 attention has been devoted to physics of metals with an insistence both flattering and disturbing to metallurgists. Any of the latter, who graduated from college more than five years ago regarded thermodynamics and X-ray crystallography as advanced subjects. Now they learn that those vague figures on the dawning horizon are equations of wave and quantum mechanics advancing hand in hand with the various evanescent corpuscles of nuclear physics. It has somewhat the appearance of a "Metallurgical New Deal," which is not to be ignored whether one likes it or not.

# Improved Copper Alloys Meeting Severe Service

BY H. P. CROFT
Chief Metallurgist,
Chase Brass & Copper Co., Cleveland

■ THE PROCESS for manufacture of continuous cast copper rod and billets, previously mentioned as being in the experimental stage, has attained a commercial basis and billets so made are now available for piercing into tube shells. These are made from phosphorus deoxidized copper and are of high density and quite free from internal defects.

One precipitation hardening alloy of unusually high physical properties has been placed on the market during the year. This contains: Copper, 91.0; nickel, 7.5; and aluminum, 1.5 per cent. Maximum properties are developed by a solution treatment at 1650 degrees Fahr., followed by a precipitation treatment at 860 degrees. Properties of this new alloy may still be further improved by cold working either between these two treatments or after the low temperature operation.

Greatest use for the alloy has been found in manufacture of hot forged bolts and other items which can be fabricated to shape readily at elevated temperatures but which can be subsequently heat treated to develop much higher physical properties. In the forged and heat treated condition, 90,000 pounds tensile strength, 65,000 pounds yield point and 20 per cent elongation in 2 inches minimum values can be met. Rods and other shapes which will admit of cold working after the precipitation hardening treatment may have the tensile strength increased to approximately 110,000 pounds with a slight reduction in ductility.

Adoption of hypoid gears by automobile makers necessitates use of so-called EP lubricants. Due to presence of chlorine or sulphur in these lubricants, bearing materials previously used corroded badly. To resist this corrosive action, a patented alloy has been developed containing nominally: Copper, 87; aluminum, 4; iron, 2; and zinc, 7 per cent. It functions nicely as a bearing material and resists well the corrosive action of these lubricants. In the ¾-inch rod this can be produced with a tensile strength of 110,000 pounds per square inch and a corresponding elongation of 15 per cent in 2 inches.

High or yellow brasses, that is, those containing from 55 to 75 per cent copper, balance zinc, with or without minor additions of other metals have been susceptible under some conditions to that type of corrosion known as apparent dezincification. The mechanism is probably that of solution of both the copper and zinc followed by precipitation of the copper which usually oxidizes in situ. This results in a spongy red deposit leading eventually to failure of the part. The yellow brasses do not always corrode in this manner, but there are many waters and other chemical conditions which promote this type of failure.

It has been found that antimony, if present to the extent of about 0.10 per cent, renders the all alpha yellow brasses, that is, those containing 63 to 75 per cent copper, resistant to this type of attack. As a result, antimony-bearing high brass and antimony-bearing Admiralty tubes are finding wide use for condenser installations where dezincification has caused early failure of yellow brasses.

Bimetallic strip, that is, a combination of metals of dissimilar coefficients of thermal expansion used for temperature control work has been marketed for many years. A recently developed process, however, bids fair to revolutionize this industry due to the extremely low cost and high production available with a minimum of equipment.

Some rod and tube mixtures give a rough surface as cast and consequently require some operation which will remove this rough surface to produce finished rod or tubing with fine surfaces. Heretofore practice has been to use rotary turning tools similar to the scratching tools formerly employed for overhauling sheet bars. Adoption of a scalping die through which the rods or tubes are drawn, as in a drawing operation, has speeded up this work as well

# A SPENDING PROGRAM THAT WILL WIN *Your Vote*

A few weeks ago, National Steel Corporation announced plans to spend $5,000,000 on plants of the Weirton Steel Company, at Weirton, W. Va., in further diversification of that division's products.

Work on that impressive project already is under way; and the full program of improvements and new equipment will be completed before another summer.

In recent months, the Great Lakes Steel Corporation at Detroit, another division of the National Steel Corporation, has spent many additional millons to increase and improve production.

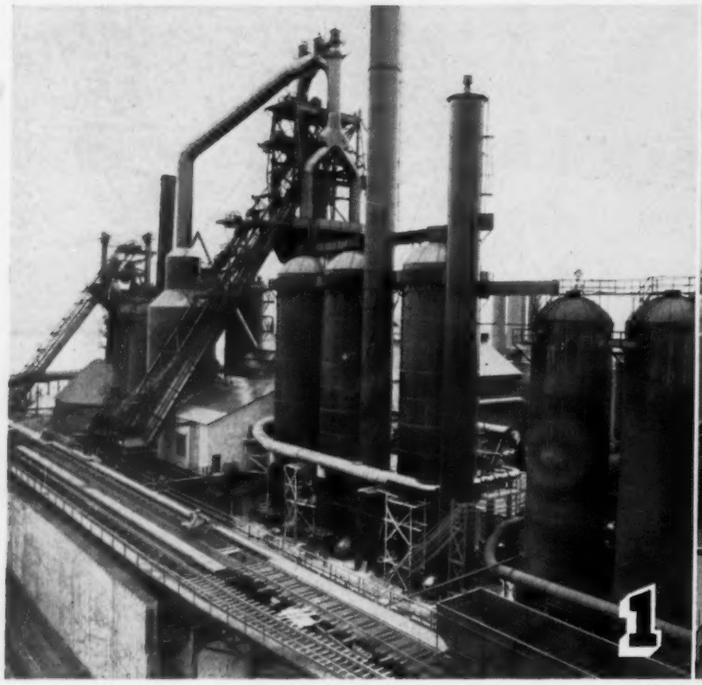
Diversity and flexibility of products and operations have been the consistent policy followed by National Steel Corporation since its inception.

National Steel Corporation never has hesitated to spend whatever might be required to maintain its production constantly a step ahead of possible demands.

## NATIONAL STEEL CORPORATION

*Owning and Operating*

WEIRTON STEEL COMPANY . . . . . GREAT LAKES STEEL CORPORATION
HANNA IRON ORE COMPANY . . . THE HANNA FURNACE CORPORATION



# GREAT LAKES GROWS GREATER

## . . . to serve its customers better

Great Lakes Steel Corporation has recently completed an expansion program which greatly increases its productive capacity and adds several new products to its already diversified list including a new high tensile steel of unusual cold formability.

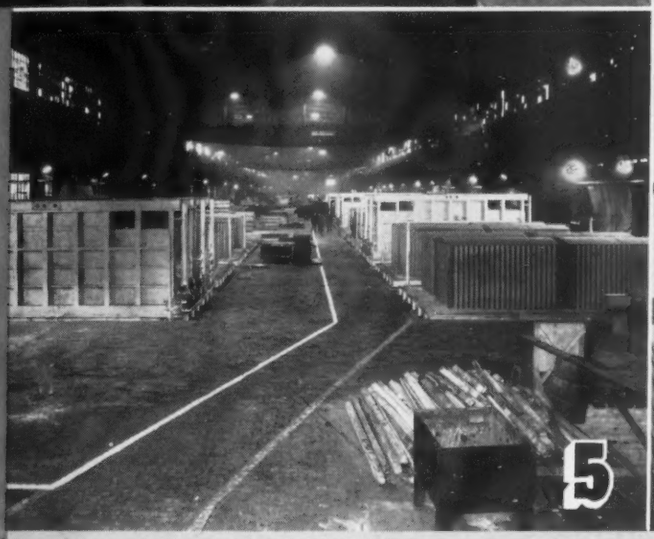
Among the important improvements and new equipment provided by this program are:

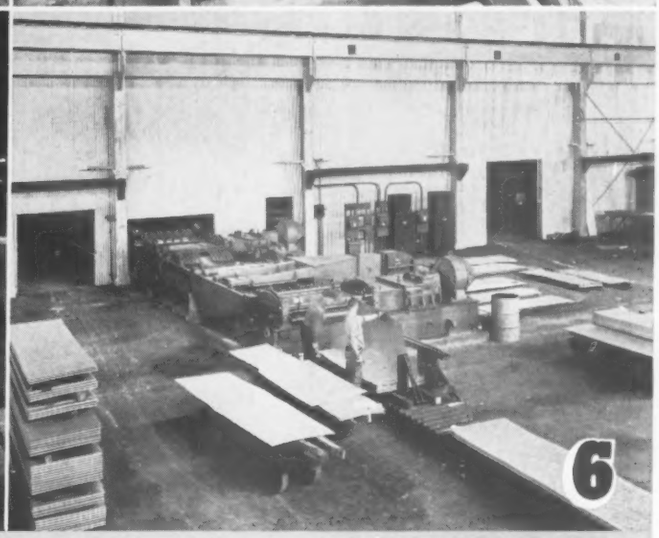
1. A new 1,000-ton blast furnace.
2. 130 new coke ovens of the most modern design.
3. Four 200-ton open hearth furnaces—with all necessary auxiliary equipment.
4. A new 46-inch blooming mill.
5. New annealing equipment sufficient to handle an additional 40,000 tons of steel per month.
6. The most modern galvanizing equipment available—to produce Galvanized Sheets.

The youngest large producer in the industry, Great Lakes Steel Corporation always has kept its operations closely keyed to the needs of its customers. Its present program of expansion and development assures uninterrupted continuance of that service to you.

*Great Lakes invites you to make its Booth (No. A-317) your headquarters while attending the 20th National Metal Congress, in Detroit, Oct. 17-21.*

DIVISION OF




**PRODUCTS OF GREAT LAKES STEEL CORPORATION**

**Hot-rolled Strip · Merchant Bars · Forging Bars · Automobile Spring Steel · Bar Mill Sections · Billets · Plates · Sheet Bars · Automobile Sheets · Cold-rolled Sheets · Hot-rolled Annealed Sheets · Pickled Sheets · Galvanized Sheets · High Tensile Alloy Steel · Michigan Metal for Vitreous Enameling.**

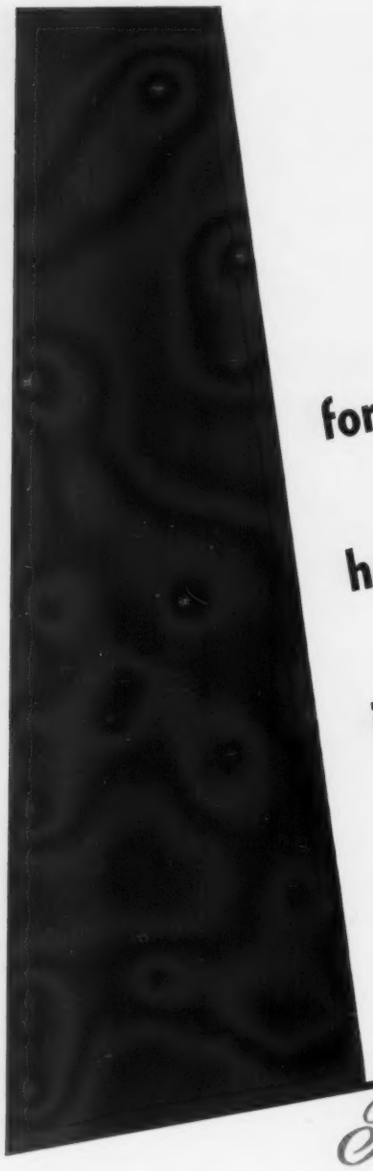
**Stran-Steel Metal Framing—for residential and commercial construction.**

NATIONAL STEEL

## GREAT LAKES STEEL CORPORATION · DETROIT, MICHIGAN

DISTRICT OFFICES: *Boston,* 1001 Statler Building; *Buffalo,* 1000 Walbridge Building; *Chattanooga,* Hamilton Bank Building; *Chicago,* 1026 Builders Building; *Cleveland,* 820 Leader Building; *Dayton,* 846 Third National Bank Building; *Indianapolis,* 1215-17 Circle Tower; *New York,* 405 Lexington Avenue; *Philadelphia,* 407 Liberty Trust Building; *St. Louis,* 3615 Olive Street; *San Francisco,* 824 Sharon Building; *Toledo,* 906 Edison Building.

# NATIONAL STEEL CORPORATION



for more than three decades the name

WEIRTON

has stood for unsurpassed

QUALITY

in the steel products we produce, and for

SERVICE

which satisfies the needs of every customer

*Today* in keeping with the Weirton policy of leadership, work is going forward rapidly on an expansion program that will greatly increase both our list of products and our ability to meet changing consumer demands.

Some $5,000,000 is being spent on new equipment, and on plant improvements which will be completed before the next mid-year.

These new facilities will extend our range of structural shapes, including sections for car building and ship building, and will add a full line of steel piling and other special sections. The new equipment also will roll all sections of rails.

Improvement of processes and products is Weirton's never-ceasing concern. Whenever it is a question of uniform high quality steel, the suitable answer always can be found in a Weirton product.

DIVISION OF

**PRODUCTS OF WEIRTON STEEL COMPANY**

Pig Iron · Open Hearth Steel · Billets—Slabs · Sheet and Tin Bars · Steel Plates—Tie Plates · Angles, Beams, Channels · Hot Rolled Strip Steel · Cold Rolled Strip Steel · Hot Rolled Sheets · Cold Rolled Sheets · Long Terne Sheets · Galvanized Sheets · Cold reduced Weirite and pack rolled Coke Tin Plate · Charcoal Tin Plate · Copper Bearing Terne Plate · Tin Mill Black Plate · Angle Bars—Rails—Spikes · Bars—Rounds—Squares

NATIONAL STEEL

## WEIRTON STEEL COMPANY • WEIRTON, W. VA.

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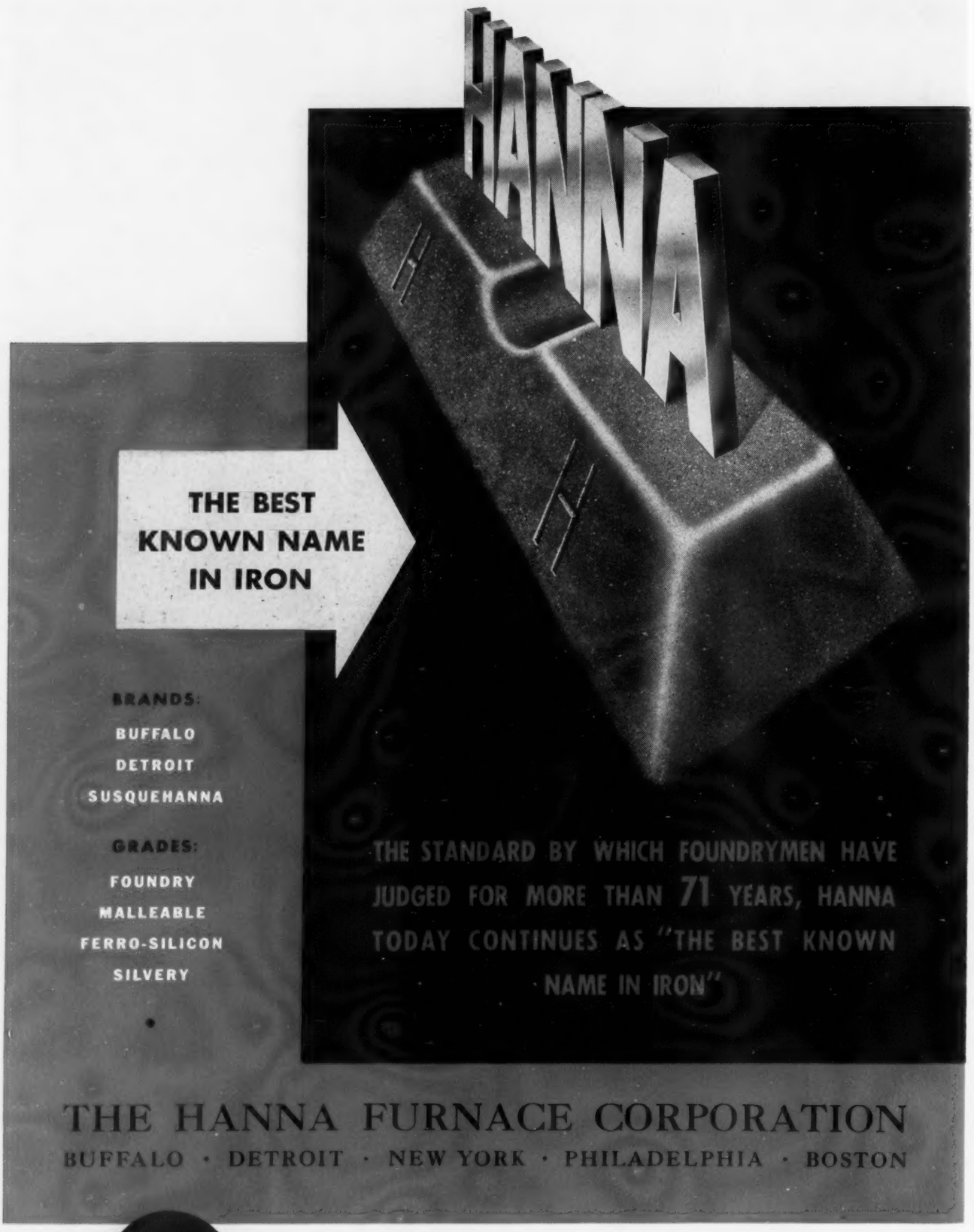
## NATIONAL STEEL CORPORATION




NATIONAL STEEL

MERCHANT PIG IRON DIVISION

NATIONAL STEEL CORPORATION

as resulted in a lesser amount of scrap and a better surface.

Cast-iron molds for casting flat bars for subsequent rolling have been of various designs. These molds, however, are subject to warping and cracking. This has been overcome to a considerable degree by use of a built-up mold having a steel framework with a cast iron liner into which the metal is poured.

# Nickel Is an Influential Element in Many Alloys

BY TECHNICAL STAFF
International Nickel Co. Inc., New York

■ THE CURRENT year witnessed continued expansion and diversification of use of alloys containing nickel, an increasingly large number of parts of machinery and equipment now being fabricated from a variety of alloys of which nickel is an influential constituent. Recent trends include increasing consumption of stainless steels, expanding use of nickel-molybdenum steels for highly stressed parts, and nickel cast irons for pressure components and parts subject to heat, abrasion, wear and corrosion.

Expansion in use of nickel-bearing stainless steels of the 18-8 chromium-nickel type was noteworthy in view of the low level of steel operations. Substantial progress also was made in extending applications of low-alloy high-tensile corrosion-resistant steels of the nickel-copper type.

Considerable interest has been shown in ferro-nickel alloys, the wide range of properties obtainable by varying the nickel-iron ratio being utilized in a number of applications although most ferro-nickel alloys produced are still of the Invar type used largely in thermostatic bi-metals. Another special high-nickel alloy, a combination of nickel, cobalt, aluminum and iron, has worked out surprisingly well for permanent magnets, developing high coercive force and being moderate in cost. Because of their special properties, these magnets permit compact design.

Recent developments in nickel plating includes the so-called bright nickel plating process, introduction of automatic machinery, and depositing of heavy coatings at high current densities. It is now possible to plate strip steel continuously and fabricate pressed and drawn articles directly from this product. Many articles, difficult to buff in the fabricated state, can be made from steel strip plated in this manner.

Among nonferrous developments of importance in the past 12 months has been Z nickel, a heat-treatable alloy containing 98 per cent pure nickel, which, in certain forms, has been produced with a tensile strength as high as 250,000 pounds and hardness values up to 46 Rockwell C. The alloy retains all the corrosion resistance and other properties of nickel.

Of outstanding interest, also, has been increased use of Inconel exhaust manifolds and cabin heaters for airplanes. This high nickel-chromium alloy is exceptionally successful in resisting heat and corrosion in this service. Advances have been recorded in the field of clad metal with Inconel-clad steel becoming an important factor. A recently introduced companion to nickel-clad steel, it is useful where the relatively low cost of steel construction is desired with the corrosion resistance and other properties of Inconel. Perfection of a method for cladding rolls of steel, iron, bronze, aluminum and other materials with nickel, Monel and Inconel has lead during the year to solution of many roll problems in the pulp, paper, textile and associated industries.

Research has brought about wider applications for K-Monel, heat-treatable alloy of Monel with a small amount of aluminum. Activity also has been marked in extending use of some of the newer forms of foundry products. Important among these are S Monel and H Monel. These differ from standard Monel in greater hardness and in the degree of non-galling properties.

A noteworthy development was use of approximately 60,000 pounds of rolled nickel for lining of the cargo tanks of an ocean-going freighter. Chief service planned for this vessel is carrying caustic soda which must be free of iron, copper, or other metallic contamination which might affect the value of the caustic for certain applications.

Commercial production was started on a new type floor and step plate for dining car kitchens, galleys, chemical plants and elsewhere where there is need for a corrosion-resistant flooring providing sure footing. This consists of Monel sheet upon which small buttons are brazed.

# Better Nonferrous Metals Spur Product Redesign

BY C. J. ZAISER
General Manager,
Ampco Metal Inc., Milwaukee

■ DURING the last four or five years, but more particularly during the past year, we have noted two definite trends in the field of nonferrous metals. The first is widespread redesign made possible by improved alloys and made necessary by the demand for better products. The second is growing realization that the metallurgical aspect of bronzes is just as important as that same aspect of the ferrous alloys.

With regard to redesign, it is generally realized that redesign is made possible by reason of the high-strength alloys now available. In many machine parts, allowable unit stresses for bronze are still figured on the basis of a 40,000-pound tensile alloy. Through redesign, a more economical, more compact, more attractive unit can be and is being utilized. This trend was first strongly observed about 1930, and has continued and been accentuated since. In the past year, it has probably been fostered by depressed business activity, and its corollary of more time available to engineers for working out constructive changes.

The second trend, that of wider attention to metallurgical aspects of nonferrous alloys, is a corollary of the first, and has been aided immeasurably by technical groups such as American Society for Metals

and the American Society for Testing Materials, etc.

Today it is generally realized:

1. That there is a vast difference in bearing characteristics and wear resistance of various bronze alloys. They are not nearly identical as was the generally accepted belief a decade ago.
2. That a microstructural examination ofttimes will tell more about the qualifications of a bronze for difficult service than will a physical test.
3. That there has been a renaissance in the nonferrous industry which has resulted in development of many new and superior alloys.
4. That the exacting demands of modern industry demand higher quality and closer control of nonferrous alloys than ever before; the day of the rule-of-thumb bronze foundry is passing rapidly.

The foregoing, which are two of the most outstanding evidences of metallurgical progress and trends are logical developments of industrial progress. Ferrous metallurgy continues to occupy the spotlight because of the preponderance of ferrous metals used, but the bronze industry as a whole is undergoing sweeping changes in products and processes, and research is no longer generally confined to the steel industry.

Any industries using appreciable amounts of the red metals will do well to ascertain that their specifications are taking full advantage of the available results of bronze industry progress in recent years.

# Modifying Elements Play Important Role in Steel

BY W. J. PRIESTLEY
Vice President,
Electro Metallurgical Co., New York

■ BECAUSE of the importance now placed on fine steels, especially by the aircraft industry and by army and navy departments, steelmakers are particularly interested in the effects of newer types of deoxidizers in producing cleaner metal. Use of calcium-silicon and calcium-manganese-silicon added before the final aluminum addition has, for example, been found effective in improving ductility and impact strength of steel castings, or maintaining consistently good results with freedom from occasional erratic heats.

This is particularly true for steels of relatively high sulphur content. Hot rolling properties of wrought high sulphur steels have been improved by use of silico-manganese as an initial deoxider in the furnace. This latter alloy also has proved effective in eliminating blisters in galvanized steel.

In the field of fine steels, progress has continued as regards the stainless steels in making them more suitable for an ever-widening field of application. Due to increasingly severe service conditions under which these steels are called to operate, certain modifications have been developed to broaden their usability. The more recent developments in stainless steels are concerned with the modifying elements manganese, molybdenum and columbium.

All stainless steels regularly produced carry nominal amounts of manganese, usually about 0.30 to 0.70 per cent, because of its utility as a deoxidizer and scavenger. Recent work has shown the value of increasing the limits of manganese in austenitic steel up to 2 per cent so that higher percentages may be used when deemed advisable. Higher manganese steels seem more ductile at high temperatures and susceptibility to tearing is diminished while rolling and fabricating.

Improvement is also indicated in the welding qualities of higher manganese steels and welding rods. Manganese is added as a modifying element and does not replace the nickel. Replacement of part or all of the nickel by manganese to form chromium-manganese stainless steels is occurring to a considerable extent in Europe and to a lesser extent in this country. Chromium-manganese steels have a more silvery luster that makes them ideally suited for flatware and hollow ware. While slightly inferior to chromium-nickel steels as regard general corrosion resistance, they have superior resistance to sulphurous gases at high temperatures and to certain organic chemicals.

Recent researches on contact and sea water pitting of stainless steel indicated that addition of 3 per cent molybdenum to austenitic steel would effect considerable improvement in pitting resistance. However, such amounts of molybdenum increased the difficulty of hot working the steel. Also, in or near welded sections the molybdenum steels frequently pitted.

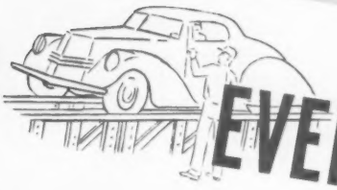
Addition of columbium, a strong carbide former, reduces the amount of molybdenum required for pit resistance as part of the molybdenum was combining with the carbon. Also, as columbium stabilizes the steel, the steels modified with molybdenum and columbium do not require heat treatment after welding or fabrication to eliminate susceptibility to intergranular corrosion. They are quite resistant to contact and sea water pitting. Both the manganese and nickel contents of these steels are increased slightly for structural stability.

# Powder Metallurgy Has Most Promising Future

BY A. J. LANGHAMMER
President, Amplex Division,
Chrysler Corp., Detroit

■ POWDERED metallurgy is a subject of fascinating interest. It is in its infancy and no backlog of data is available. In working with powdered metals, one soon discovers that they react differently and must be treated differently than metals produced by standard methods. Thus there is a continuous string of problems involving both metallurgy and shop practice. If a briquetting press is set up to make the same part on 20 different occasions, no two of the set-ups would be alike. Varying quantities of materials and possibly other changes would be required.

However, powdered metals offer the engineer and metallurgist advantages and materials that are not otherwise obtainable. For instance, Oilite, the oil-

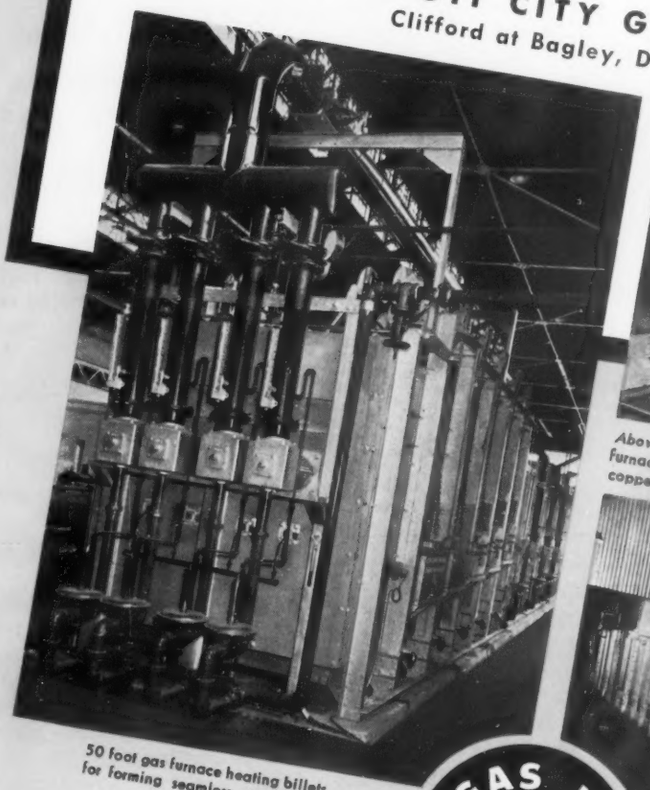
# GREATER  EVERY YEAR!

## DETROIT INDUSTRY'S USE OF *Gas*

PROGRESSIVE DETROIT INDUSTRY swings more and more to the use of gas in the processing of metals. Industrial consumption of this finer fuel jumped 70% in 1937 over 1936. 7500 new pieces of equipment, including practically every type of industrial apparatus requiring heat, have been attached to the lines of the Detroit City Gas Company in the past six years.

We are proud of our part in the fabrication of the fine products which carry the fame of Detroit around the world. Our laboratories are continually testing new and experimental gas equipment, under actual operating conditions, for our industrial customers. Our aim is to increase the extent and value of our service to Detroit Industry.

**DETROIT CITY GAS COMPANY**
Clifford at Bagley, Detroit, Michigan



50 foot gas furnace heating billets for forming seamless steel tubes.

*Above* — Belt conveyor gas furnace for the annealing of copper tubing.

*Below*—One of a battery of continuous type gas furnaces for tempering automobile leaf springs.

GAS IN INDUSTRY

cushion bearing developed by the Chrysler Corp. has the advantage of universal use for heavy-duty applications. For extreme pressures and low velocity applications, Super-Oilite, an oil-cushion "sponge iron" composition bearing is available and has proved successful for unit pressures in excess of 40,000 pounds per square inch.

Normally, a bearing under load dissipates the lubricant, where the oil-cushion bearing generates and maintains a continuous oil film. Applications cover a wide field, a striking example of what can be accomplished by powdered metallurgy, being the retainer used in automotive clutch throw-out bearings. These bearings will withstand 1,000,000 to 2,500,000 declutchings. This is but one of the desirable characteristics obtained in the performance and economics of thrust ball bearings.

At this writing, powdered sponge copper is used in considerable quantities, but much work is yet to be done in perfecting it for specific requirements. A group of specially trained men is carrying out a broad research program to the end that desirable improvements may be obtained.

Attractive economies could be effected by a standardization of plain bearings, flange bearings, thrust bearings, and self-aligning units. As each set of tools is applicable only for a bearing of a given size within very narrow limits, the merit of a suitable standard such as employed normally by the S.A.E. or A.S.M.E. is obvious. Preliminary work on this activity is in progress.

The subject of powdered iron or powdered sponge iron is a story in itself. A great deal of development work on this subject has been carried on in this country. In the writer's opinion, attending problems for the production of sponge iron on a volume basis are now understood and mastered by some engineers. It is also the claim of qualified experts that sponge iron on a volume basis can be produced at what sounds like a ridiculously low figure. Promotion of such an enterprise appears to offer unlimited opportunities. If a production project were undertaken in this country, it would receive wide encouragement.

It is the writer's conviction that some of the next great developments in the metallurgical field will be made in powdered metals.

# Cemented Carbide Tools And Dies in Wider Use

BY K. R. BEARDSLEE
General Sales Manager,
Carboloy Co. Inc., Detroit

■ LOOKING back over the year, it is gratifying to see the wide extent to which use of cemented carbides has grown during this short time. In the drawing die field, two important factors are bringing this about:

1. The buyer of wire and allied products is insisting on closer tolerances and more rigid physical specifications in an increasingly greater range of products. In many cases it is possible to meet these specifications only by use of cemented carbide dies.

2. Due to standardization, drastic reductions in cost of most types of cemented carbide dies have been made in the past year. Furthermore, many users have learned that they can purchase cored or unfinished dies and finish them themselves at much lower total cost.

Because of these factors as well as increased experience on the part of the user and the cemented carbide manufacturer, we also see material advances in fields allied to drawing dies. For example, bolt sizing and burnishing dies have worked out economically and improved the final product on many different applications. Sheet metal punch and draw dies also have proved their practicability in a number of new places. Use of cemented carbide wire forming tools, guides, and knives, has saved so much money for users that today they are commonplace.

Advances in application of cemented carbides to cutting tools have, if anything, been more rapid than in the die field:

1. More and more users are learning that their cemented carbide tools pay for themselves many times over before they are worn out—that they frequently return their original investment cost in a few hours' use. The old idea that high production is necessary to justify cemented carbide has been banished.

2. Better cemented carbide is available today. The manufacturer can make an improved product and, in addition, he knows more about successful application of tools.

3. Real advances have been made in teaching the user more about how to use these tools. Besides a force of field service men who work in addition to salesmen, our company has instituted a customer education course which was attended by over 5000 users last winter and which was made available again after Sept. 1.

4. Many tool manufacturers are now designing their special tools around cemented carbide, which means better "particular" tools, such as reamers, milling cutters, counterbores, etc., at lower prices.

5. Machine tool manufacturers are more and more designing machines that will get the most out of cemented carbides with a resultant increased production at a lower cost.

Because of these factors it is not unusual today to find plants working toward 100 per cent cemented carbide tools. Certainly, in the future there will be many more.

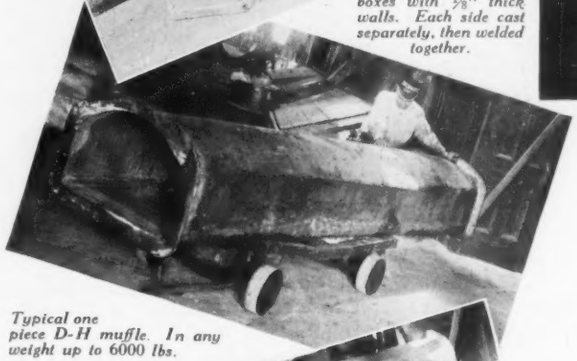
With all these advancements in both tools and dies in such a short time, cemented carbide is certainly in a much better position to make real and substantial savings for industry.

A word about steel cutting—considerable progress has been made during the past year in the further development of steel cutting with cemented carbides. Experience has shown that many failures attributed to the carbide itself often are turned into successful jobs when tool design and application are more exhaustively analyzed. With importance of this factor realized, it has been found possible to apply numerous existing grades of cemented carbide successfully.

Because of this, attention has been directed during the past year more to design and application and less to development of special grades. It is evident this is a step in the right direction. However, this should not be interpreted to mean that work

*Carburizing boxes with ⅛" thick walls. Each side cast separately, then welded together.*

# *Backed by* THREE DECADES of Specialization



*Typical one piece D-H muffle. In any weight up to 6000 lbs.*

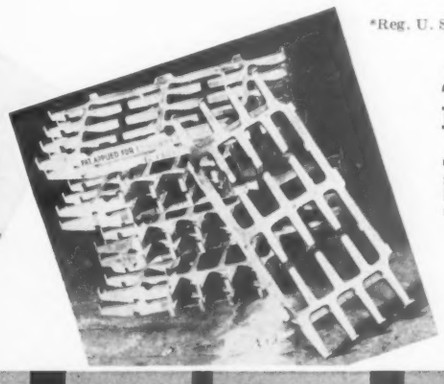
*Cast round carburizing boxes with lids.*

● NICKEL-CHROMIUM alloy in cast and wrought forms . . . any size, any weight, any shape . . . for carburizing, normalizing, malleabilizing, enameling and other heat-treatment purposes—that is the business of the Driver-Harris organization these past thirty years.

Engineering and production skill thus gained is reflected in that added measure of service and long life for which D-H castings and pieces of NICHROME*, CHROMAX*, and CIMET* are world renowned.

*Reg. U. S. Pat. Off.

*Rectangular lead pot. A difficult casting job.*



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*Speed Reducers*

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on development of new grades for cutting steel has been lessened. A number of new steel cutting grades have been developed by various cemented carbide suppliers during the past year that are being used with satisfactory results. With this progress, we look forward to successful solution of the steel cutting problem.

# Cold Forging Industry Is Expanding Its Field

BY A. E. R. PETERKA
Technical Assistant to Vice President,
Lamson & Sessions Co., Cleveland

■ ANY ONE who can see beyond immediate profit will agree that one of the compensations of a depression is stimulation of development and research. New products are developed and new methods for manufacture of old ones are devised. The bolt, nut and rivet industry certainly has not been an exception to these conditions. As a matter of fact, an added stimulant presented itself in the highly publicized activity of the welding industry. However, after the first fright subsided, manufacturers of rivets, bolts, screws and nuts, saw more clearly the limitations of each method of fastening materials together and realized the quite definite field or scope of each, and were thus better enabled to concentrate their energies in the development line along proper, natural channels.

Among many new products in the cold forging industry, perhaps the most spectacular has been development of so-called "specials." Although these specials are cold forged on bolt-making machinery, many do not resemble the common conception of a bolt by the greatest stretch of the imagination. Parts have been produced by cold forging which in the past were thought possible only as screw machine products. Items which formerly were assembled from several pieces are now made integral by cold forging. Certain parts made by drop forging and casting, requiring subsequent machining operations, are now made by cold forging, eliminating machining and producing parts to accurate dimensions of intricate design.

It has been practical to use certain expensive raw materials because by cold forging little if any raw material is wasted.

In the field of bolts and cap screws, one of the important steps has been development of double extrusion. This method of manufacture increases strength, reduces cold upsetting strains in the head of the bolt, and increases accuracy of thread and shank dimensions.

In the field of nuts, there have been many developments. Perhaps the most far-reaching is the cold-forged nut. In its manufacture, round wire in coils is cut off and upset, and most of the metal at the center of the slug is extruded to form the hexagon shape. By this method a nut is produced having accurate dimensions and fine finish because these factors are accurately controlled by carefully made dies. Raw material scrap losses are reduced materially because only a relatively small amount of the metal must be punched out for the nut hole. Greater strength results from cold working of the metal, and last, but not least, a nut is produced in which crystal flow approaches the ideal for this type of product.

Much activity has taken place in development of economically practical locking nuts which may produce interesting results in the near future.

One can hardly discuss developments in cold forging without commenting on the attitude of the industry toward engineering. The industry as a whole is definitely becoming more engineering minded. This applies not only to employment of engineers, chemists, metallurgists, and time and motion-study engineers in manufacturing and development, but also in the sales department where the engineer has been found to more than "earn his keep."

# Zinc Die Castings More Complex, Thinner Section

BY H. W. SMITH JR.
Market Development Division,
New Jersey Zinc Co., New York

■ TWO TRENDS are dominant in an eventful year's progress in the field of zinc alloy die castings: (1) Use of the process for producing parts and mechanisms long ruled out by limitations of other manufacturing methods; and (2) attainment of thinner sections, more complex forms, and more perfect finishes through improved die casting technique.

Many an ingenious mechanical design which has been in "cold storage" for years because it is difficult to achieve by traditional methods of parts manufacture, has come into its own through the zinc alloy die casting process. Die casting allows amazing latitude in the shape, intricacy and size of parts.

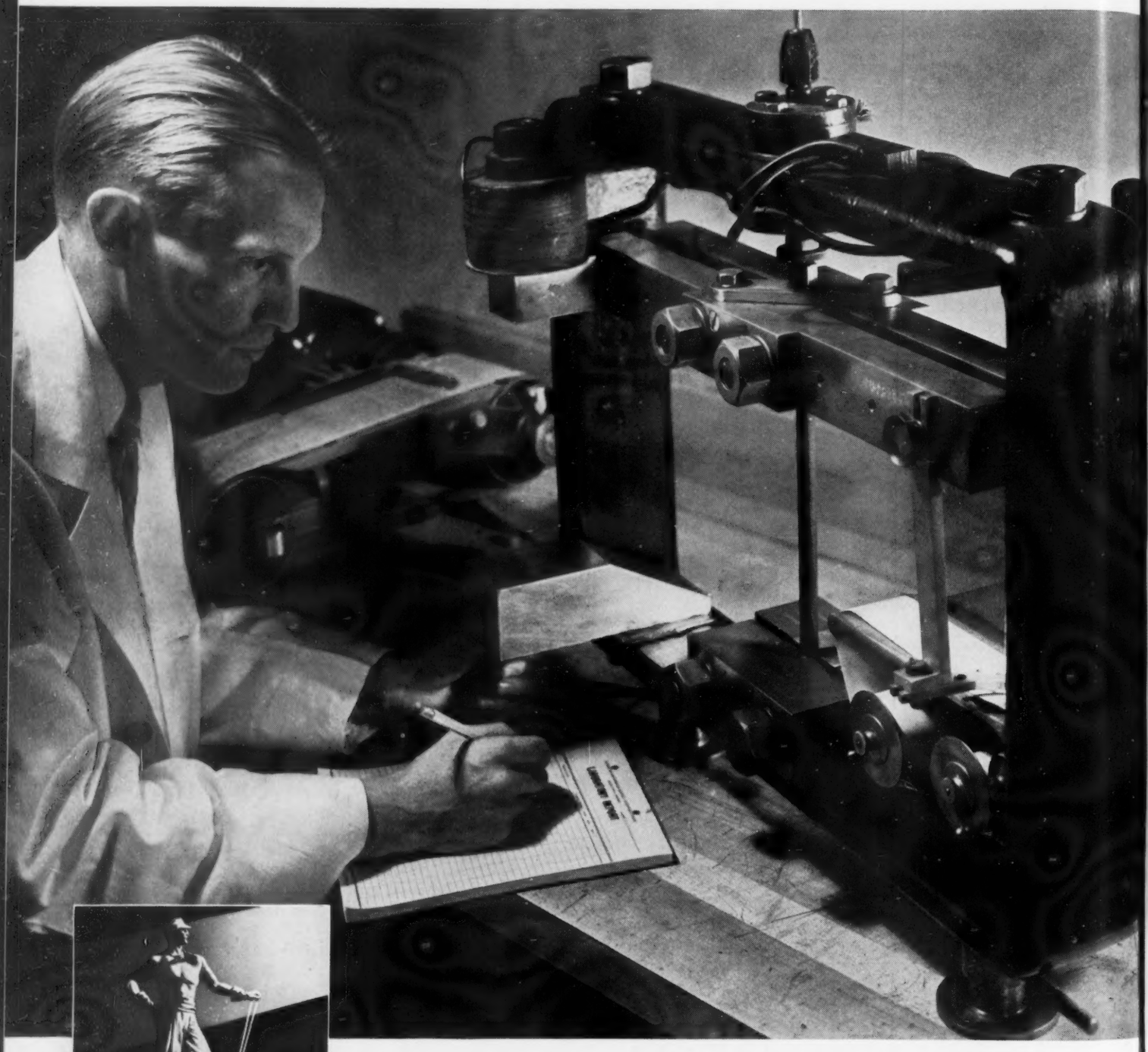
An example is a new principle oil pump rotor which writhes like a universal joint in a spherical chamber. This design could not have been produced by any other method without prohibitive machining on nearly every surface. As a zinc alloy die casting, the parts require no machining or finishing whatsoever—even holes and keyways are cored.

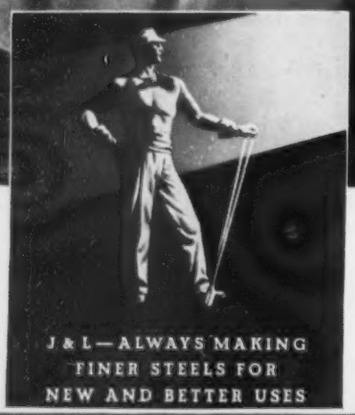
Another case of doing something in die castings which would not be economically feasible otherwise is combining in one piece a precise parabolic flashlight reflector and heavy threaded shank. The parabolic reflecting surface is permanently perfect as cast—it cannot warp from internal strains; its surface is smooth; its mathematical form is as absolute as the polished cavity in the steel die; and it is effectively silvered by no more than a light buffing and a clear coat of lacquer.

Because of the remarkable castability of the zinc alloys used for die casting, manufacturers are finding zinc an ideal metal for parts of thin section. A bicycle builder using a three-piece housing reduced its weight to 22 ounces, despite its 13 x 8 x 4-inch size, by die casting the part only 0.024 to 0.030-inch thick.

A third trend of the year in zinc alloy die cast-

# *When you ask for*
# "INFORM





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J & L metallurgists from the mills and from the field will be in attendance at the J & L exhibit to discuss your steel problems with you and give you helpful suggestions in the application of J & L Steel. They also have news of developments in research being conducted in the J & L "Pilot" Mill.

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ing is acceptance of the metal and method in new fields. Producers of industrial equipment and machinery, for example, seem to be taking up the modern production methods in a big way. Die castings may now be found in quantity on printing presses, packaging and processing machinery scales, compressors, lubricators, textile machinery, oil field equipment, controls, tractors, and the like. They can take the punishment and are easier to design for, and more economical to produce. Also, in the realms of hardware, photographic equipment, business machines, electrical products and tools, use of zinc alloy die cast assemblies has increased significantly in 1937 and 1938.

## Knowledge of Metals Is Aid To Heat Treatment

BY G. C. RIEGEL
Chief Metallurgist,
Caterpillar Tractor Co., Peoria, Ill.

■ THE PAST 12 months have witnessed many refinements in application of metals and their heat treatment, based on better knowledge and closer selection of the composition of the metals. Progress was in this direction, rather than in new processes and methods.

Certainly, extension of the use of the high-strength low-alloyed steels, the increase in the use of welding for fabrication, greater interest and understanding of the factors influencing hardenability of steel, and the extension of atmosphere control in the methods of heat treatment, are distinct majors of the same kind of knowledge, but only to a higher degree than was already existing at this time last year. Progress of this type is continuous.

## Auto Parts Wear Reduced By Surface Treatments

BY L. A. DANSE
Metallurgist, Cadillac Motor Car Division,
General Motors Corp., Detroit

■ COMPOSITION and heat treatment of steel, particularly as used for automotive parts, has been developed intensively for years, but in spite of all developments, design engineers are still considerably hampered in their efforts to make automobile power plants more compact, powerful and better able to resist wear and stress. A new era is foreshadowed in that there are being advanced new surface treatments of a chemical nature, or a combined chemical and physical nature, which bid fair to affect design, material and heat treatment.

For several years lubricants have been available which will permit automotive gear sets to operate under loading, which, with the old familiar lubricants, would have caused almost immediate breakdown and failures. These lubricants have made possible the use of late axle designs with hypoid gears and have permitted saving in weight and lowering of the center of gravity, which give better riding characteristics and safer operation at high speed. Accordingly, we have lubricants available ranging all the way from the old plain mineral oil, through the mineral oil plus fixed oil blends, the mild extreme pressure lubricants and on up to the so-called hypoid lubricants which permit operation of gears subjected to extreme loadings.

The same line of thought, which resulted in these lubricants making high gear loadings generally permissible, has branched out into other fields and is bringing into widespread practical use some developments of great interest.

Surface treatments have been applied for a number of years, over the finished heat treated part, such as: Copper plating on rear axle gears, camshafts, cam rollers or pins, steering ball pivots, steering sectors, differential pinion spiders; tin plating on cast-iron pistons; and anodizing on aluminum pistons. These treatments were for the purpose of minimizing scuffing and to give extreme pressure resisting characteristics.

Simpler, easier and cheaper surface treatments which will "E.P." the parts, rather than relying on lubricant to give the extreme pressure resisting properties, are being developed in several varieties, which may replace plating for E.P. purposes. The idea behind these projects is to prepare working surfaces so they will go through the so-called "break-in" period without scuffing, scoring, seizing, welding, or other damage.

In other words, it will be possible without using lubricants to have camshafts, tappets, valve stems, pistons, piston rings, cylinders, and other working parts, so protected by surface treatments that they will operate without danger of scuffing or other damage such as has been all too common where loads, pressures and speeds have been of an unusually extreme nature.

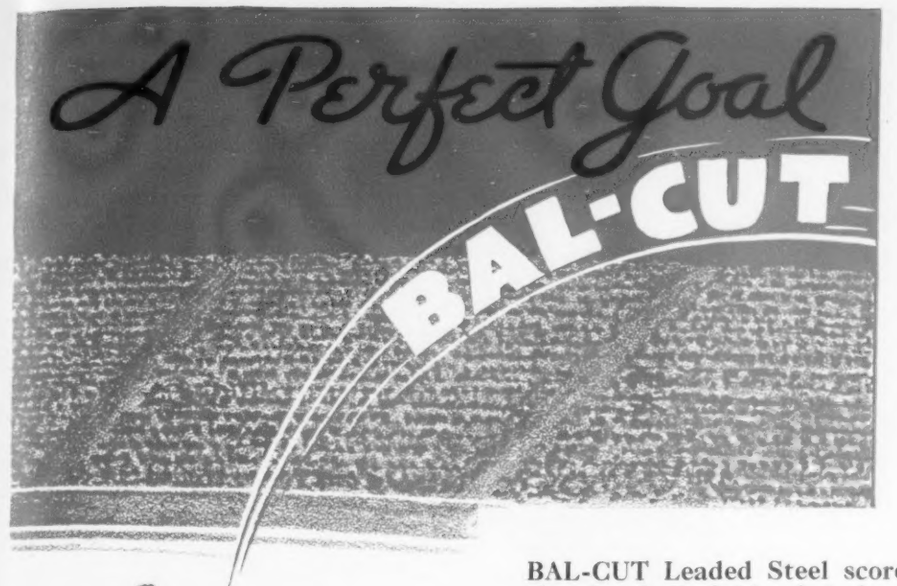
Not only do these treatments bid fair to affect the material and heat treatment of the parts, but also the surface finish. Where it has been customary to impart a high degree of surface finish to get the best possible wearing conditions, it is now anticipated that the degree of finish can be cut down and cost correspondingly reduced.

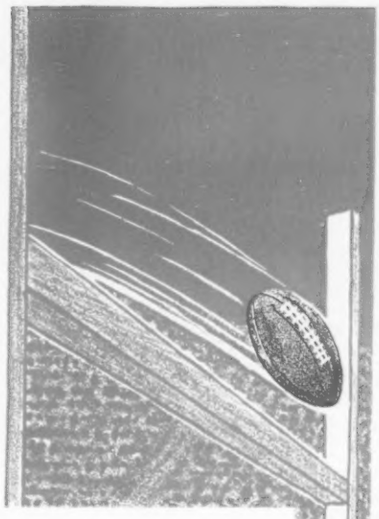
A number of these wear-resisting treatments are based on old well-known surface treating principles which have been applied to new uses and are herewith mentioned in alphabetical order:

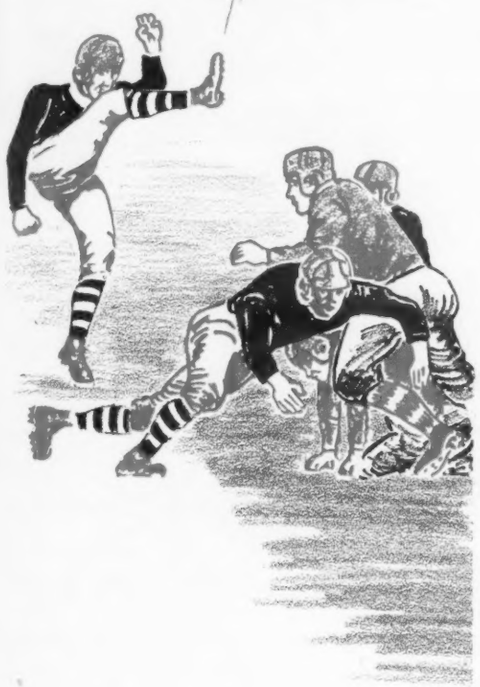
Bonderite B, Parker Rust Proof Co., a zinc phosphate coating; Ferritex, Standard Oil Co. of California, a preferential etching and sulphide surface treatment; Ferrox, Perfect Circle Co., a wear-resistant oxide coating on iron or steel parts; Granodine, American Chemical Paint Co. and first marketed in this application by the Sealed Power Corp., a manganese phosphate coating; and others under process of development.

Ferritex has been used by Caterpillar Tractor Co. during the 1937 and 1938 season on cylinder liners and piston rings. Ferrox treatment on piston rings by Buick and on automatic lash adjuster cylinders by Cadillac was first used in production by General

# A Perfect Goal
## BAL-CUT







BAL-CUT Leaded Steel scores a perfect goal on the football field of industry—and the crowd roars approval.

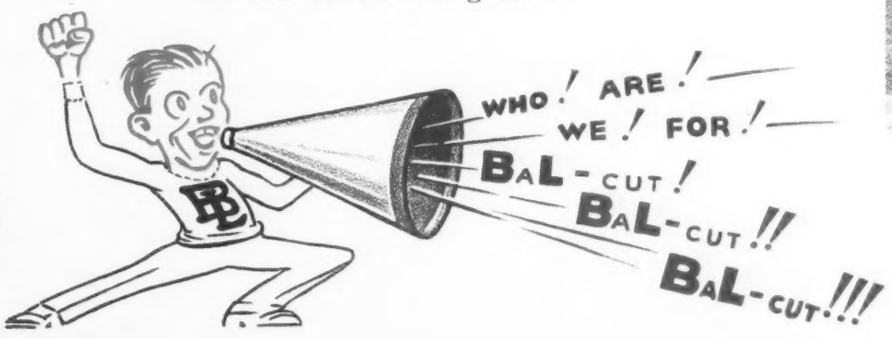
Like the timely drop-kick which adds the winning points in the last minute of play, Bal-Cut puts the extra punch into production that beats all competition in parts-making economy.

The increased machinability of 30% to 60% offered by Bal-Cut not only gives lower manufacturing costs on quality finished parts but also boosts profits and widens the outlet for fabricated machine parts.

It has almost unlimited application, because the Bal-Cut Lead Bearing series of steels includes all standard SAE analyses in both the Bessemer and Open Hearth grades.

It is easy on the tools, permitting longer runs with fewer grinds and less "time out" for the machines. Put Bal-Cut in your regular line-up and the big gains in machinability will show a saving of many dollars per ton.

There is a B & L service engineer in your district ready to advise you on special problems—and to help you reduce parts-costs by the proper use of Bal-Cut Lead Bearing Steels.

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Motors Corp. in the start of the 1938 production season in the fall of 1937. It was also put into production by Packard and Plymouth in the spring of 1938 on piston rings. Granoseal, from Sealed Power Corp., was started into production in May, 1937, and has been used on piston rings for Buick and its forerunner Granodine 101 is in production on camshafts for Oldsmobile.

It is remarkable how use of surface treatments, even on mediocre base materials, results in not only added but multiplied life under service. Camshafts and tappets which would give a percentage of difficulty due to scoring and spalling, no matter what the combination of materials and heat treatment might be, will run indefinitely under increased loading with proper surface treatment. Piston rings and cylinders which would scuff, score and wear rapidly, even during the break-in period, will now not only go through break-in but will run throughout the life of a power plant with no difficulty, when surface treated to minimize scuffing and welding.

The intense interest being manifested by inquiry regarding the treatments, experimentation with parts treated, and research and development working toward improved treatments, surpasses anything which has occurred in automotive metallurgy at any previous time and is a natural consequence of the astounding results achieved.

It would appear that we are entering a cycle of reduced bulk and weight, made possible not by lighter or stronger material or heat treatment, but by new applications of surface treatment.

# Still Seeking Unknowns In Steel Hardenability

BY GORDON T. WILLIAMS
Chief Metallurgist,
Cleveland Tractor Co., Cleveland

■ SEVERAL interesting current trends in heat treating give promise of still greater future importance. First, in any metallurgist's list, would come use of protective atmospheres in annealing, and protective and active atmospheres in hardening. In the latter field, extension of the function of the ambient atmosphere to provide carburizing while the work is undergoing heating for hardening appears to be especially significant.

Shallow-case carburizing by gaseous media might be thought to threaten the future for the actively carburizing liquid baths, but both these and other types of molten media are being improved in stability, viscosity and ease of subsequent cleaning so that their use is growing. This new interest in use of liquid heating media has been stimulated by development of special furnaces, internally heated by resistance of the bath itself. Noteworthy is announcement of a furnace of this type whose electrodes contain heating elements, so that the required small molten pool between the electrodes can be produced more rapidly, and the previously slow heating-up time, from cold, reduced markedly.

Of course, induction heating continues to spread in application. A truly amazing number and variety of parts are being treated by this means and with a high degree of metallurgical and mechanical quality, as well as economy.

The great current interest in hardenability, its causes and measurement, is evidenced by the symposium arranged for the National Metal congress. Last year two papers discussed methods of determining hardenability on a standard basis; several papers which will be contributed this year will follow up this work.

Here, it seems to me, is the greatest field of promise in improvement in steel control. Grain-size control went a long way toward eliminating variables in response to heat treatment; control of hardenability bids fair to decrease still further the number of unknowns in the system. This added control probably will carry some extra cost, on steel alone, but it undoubtedly will result in a reduction of overall cost of finished product, which after all is the real objective sought.

It will be interesting to discover whether lead additions will improve machinability of heat-treated alloy steels, and whether they will have as damaging effect on transverse physicals as sulphur additions. If successful here, a wide application opens up in many uses where steels are machined in the heat treated condition, at say brinell hardness in the range of 350 to 400.

The metallurgist need have no fear (nor hope) that the increase in precision of material and heat treatment is going to simplify his work; as in the time-honored relation between "cops and robbers", the demands are keeping at least abreast of the ability to meet them!

# Modern Equipment Lowers Cost of Treated Product

BY S. L. WIDRIG
Metallurgist,
Spicer Mfg. Co., Toledo, O.

■ HEAT TREATING has progressed rapidly in the past few years, with use of automatic continuous furnaces, furnace atmospheres, quenching presses, dies and fixtures, having contributed much to this advance. Economic conditions of the past year have created a situation wherein it has been necessary to extend every effort to reduce the cost of manufacturing, while at the same time to maintain or improve quality of the product.

Despite the handicap of dull business for some months, considerable money has been spent for new heat treating equipment and the modernizing of old. Thus, improved methods have been provided and these have played an important part in producing a better product at lower cost. Progress in this direction has been particularly notable.

There is now a definite trend toward use of the lower alloyed or simpler alloy steels, this resulting from the demand for cost reduction and studies of physical requirements of products. More care must

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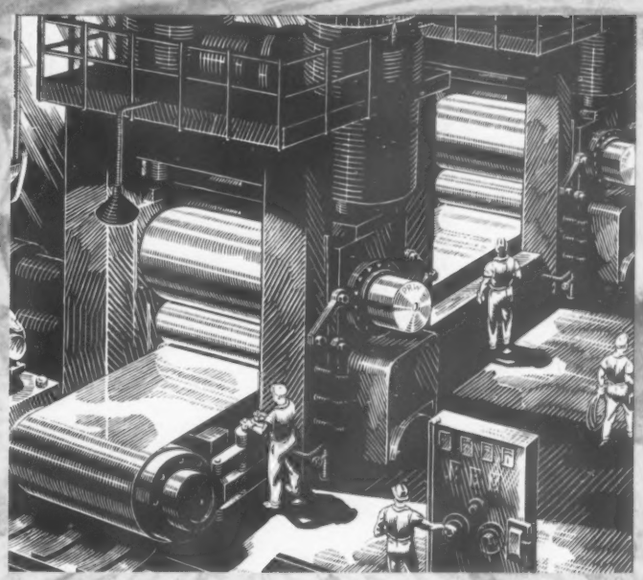
Phoenix is not only able to make better rolls, but also to suggest practical ways of increasing production and reducing operating costs.



PHOENIX STEEL, for unusual strength; PHOENIX "A" (steel alloy) for strength and wear; PHOENIX METAL—PHOENIX "K" for strength, wear and finish; PHOENIXLOY (uniformly hard) for flat rolling where high finish of extremely thin gauge of material is required to be free from all marks and defects. Also tube mill rolls of quality material best suited to the kind of service required; PHOENIX CHILL, PHOENIX NICKEL CHILL, for all flat rolling requiring finish.

*Gutzon Borglum—artist turned engineer—carving the head of Washington and other national heroes on Mount Rushmore, in Mt. Rushmore National Park, Black Hills, S. D. This gigantic undertaking has been in progress for several years and is only partially completed.*

# PITTSBURGH ROLLS

*Division of* **BLAW-KNOX CO.**

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be exercised in the heat treatment of these steels because usually it is necessary to obtain the optimum of physical properties.

Surface conditions of parts heat treated now are receiving considerable attention. In many plants, furnace atmosphere control is imperative to prevent decarburization. This control of surface condition together with control of distortion has in several cases resulted in elimination of costly operations such as finish grinding, machining and hard broaching. Particularly is this noticeable in the manufacture of carburized gears.

Gas carburizing is being used successfully in a number of plants. Under certain production conditions, the method is ideal. Contrary to predictions that solid carburizing compounds are on the way out in favor of gas as the carburizing medium, it seems that the solid compounds are as popular as ever and in some cases can be used more efficiently and economically than gas.

A better understanding of the work-compound-container relation has resulted in rather surprising results both in the carburizing and hardening operations. Work now is being carburized, cooled and reheated for hardening without its being removed from the containers until the quench. Such operations can be worked out simply and efficiently in straight-line production units.

Speed of the operations is comparable to gas carburizing because relatively small amounts of compound are used, thereby eliminating the objectionable insulating effect of the compound. Many features of this method are desirable and outstanding. Multiple conveyors may be used to produce various case depths, the work is not mutilated by handling operations, there is no decarburization in hardening, and if desired a higher carbon surface may be obtained in the hardening operation.

## Control of Temperature Improves Heated Product

BY C. L. HARVEY
Chief Metallurgist,
Lamson & Sessions Co., Kent, O.

■ A REVIEW of new developments during the past year reveals no single major contribution to the science of heat treating. However, there have been many minor developments which have improved quality of the product treated. Considerable improvement has been made in temperature control equipment so that it is now possible to hold temperature ranges within furnaces to a much closer degree.

One of the outstanding developments along this line has been in optical controlling equipment which records the temperature of the work rather than the furnace temperature.

Furnace atmospheres and equipment for producing them have been improved considerably, but there is still room for further improvement. There is great need for fundamental knowledge on the effect of various furnace atmospheres on materials at high temperature and until this knowledge is available we cannot take full advantage of controlled atmospheres.

A need also exists for gas conditioning units of small size which can be used on tool hardening equipment. It would seem that there is a real market for the small units to be used where expensive tools are to be heat treated.

## Welding Justifies Itself Technically, Economically

BY P. G. LANG JR.
Engineer of Bridges,
Baltimore & Ohio Railroad, Baltimore,
and President, American Welding Society

■ IN THE past year welding has retained and enlarged its range in those fields in which it was already used, and its application has continued to expand into other branches of industry.

In marine construction it has demonstrated itself as a practicable and economic expedient. During November, 1937, an all-welded steel oil tanker, 18,500 tons deadweight capacity, having a cargo space of 6,500,000 gallons, was launched, and in July this year another welded craft of similar type left the ways. Order for a third has been placed.

Welding has been applied in an increasing degree to construction of steel frames for buildings, streamlined passenger cars and locomotives, and to large tanks for storage of oil and other substances. Of special significance is recent completion of a 150,000-barrel welded oil tank. Indeed, approximately 90 per cent of all oil storage tanks are now welded. Welding has been used successfully in construction of the mounting for the world's largest telescope.

The longest existing self-supporting pipe span, 105 feet, has been built by welding. Flash welding has been successfully used in main line track construction. Recent developments in welding long length casing pipe appear to open new fields to this procedure. Another important development of the year is initial and successful application of welding to construction of high-pressure locomotive boilers.

Achievements in the fields of research and invention comprise greater mechanization of welding, especially of spot welding operations on automobile bodies and parts, gas cutting operations, automatic metal and carbon arc welding. Adoption of flame-softening process for special steels preparatory to cutting solves an annoying problem heretofore associated with use of certain high-strength structural steels. An ingenious expedient is the recent sealing and floating by water a distance of 3000 miles of welded containers too large for movement by ordinary transportation media.

Engineers, designers, operative welders and various industries which have adopted this procedure or which produce materials or equipment designed for use in connection therewith realize the imminent need for standardization and simplicity. To these ends, the American Welding society has tirelessly directed its efforts. Its committees on Qualification of Operators, Materials and Procedure have proceeded with devel-

opment of these matters along lines best calculated to maintain and improve the high standards necessary to secure proper results from welding in any of its fields.

The society's Building Code has been widely accepted by industry, and formally adopted as standard by many public bodies. Its Bridge Specifications have been adopted by American Association of State Highway Officials and American Railway Engineering association, for highway and railway bridges, respectively. Since issuance of this specification in 1936, its application to working conditions has been observed, and the lessons of experience recorded. The second edition of the Bridge Specifications, that of 1938, which embodies numerous changes and improvements, is now in practically complete form for issuance.

In July, the "Welding Handbook," sponsored by the American Welding society, and in process of development for several years, made its appearance. In this work of 1200 pages world experience is codified and epitomized. Welding in general theory and economic phase, and in each of its manifold fields of application, is discussed by a group of experts and specialists. This book represents the collaboration of about 350 of America's leading students and practitioners of welding.

While welding has definitely justified itself from the technical and economic standpoints, it is impossible to too strongly emphasize the necessity for imposing the highest attainable standards of material, workmanship and equipment. During the present year our European associates have been drastically admonished along these lines. Welding, through its inherent advantages, has become a definite and permanent part of the world's industrial program. Its trends continue along the lines of standardization and improvement, as the lessons of practical experience are translated into regulation and practice.

## Accuracy of Control Is Insurance to Good Welds

BY E. J. W. RAGSDALE
Chief Engineer,
Edward G. Budd Mfg. Co., Philadelphia

■ THERE always has been a sort of magic to welding and this has been unfortunate because it has seemed sufficient. As a result, welding has been insufficient. It has been almost as unreliable and as uncertain as gluing, and, certainly, such welding had no place in the structural arts. Furthermore, its past history made it even more difficult to inspire engineering confidence than if welding had only been recently discovered.

Not until the past ten years has serious thought been given toward making welding subject to such accuracy of control that it could command the proper respect. The first significant move was when skill of the operator was made secondary to control of the process.

One of the earliest appreciations of this is to be found in the Shotweld system as used for stainless steel. Not only is the welding apparatus carefully adjusted for accurate reproduction of any given weld, but its performance is permanently recorded, weld for weld, and any variation from the norm is signalized by ringing of a bell. With this, production welds can be reproduced uniformly with as little as a 5 per cent variation of shear strength. When a recorder was placed on one of the old-fashioned spot welding machines, recorded variation was 800 per cent.

This seems to represent a trend in welding, no matter what may be the process used. It may appear now that gas and arc welding are not so susceptible to precise functioning nor recording, but it must be also remembered that when the first recorder was attempted, the path was then not so clear either.

Welding has only one requirement: It must be definitely good. The process must be conducive to quality and there must be some assurance that quality is maintained. We expect this of materials; why not also of the means for joining these materials?

## Fewer and Better Codes Seems Present-Day Need

BY H. C. BOARDMAN
Director of Research,
Chicago Bridge & Iron Co., Chicago

■ PROGRESS in welding during the past year is manifested in several directions. Demand is increasing for chrome, chrome-nickel and nickel linings on mild steel shells of welded tanks, and steel companies and fabricators are showing keen rivalry in their efforts to develop and control the best method for attaching these linings to the shells. Further development may be confidently expected.

Welded construction is making greater use of low alloy steels and nonferrous metals, with a corresponding complication of the problems and plate and shape making, welding, testing, inspecting and code writing. This trend will continue.

Almost universal acceptance is accorded welded construction for oil storage tanks, whether of the atmospheric or pressure types, and for elevated water storage tanks in capacities of 1,000,000 gallons or more. A frequent utilization is being made of welded tubular columns as supports for tanks, with a consequent elimination of the horizontal struts which are essential for towers of conventional design.

Trepanning is resorted to increasingly as a means for inspecting welds which cannot be radiographed economically. Both the American Petroleum institute and American Society of Mechanical Engineers have committees studying trepanning with a view to making it a prescribed method of inspection.

Introduction of the Magnaflux method for inspecting welded joints of field erected tanks is a new development. It is too early to predict the future of this method, but experience to date encourages its continued use.

Realization of the great need for fewer and better codes is growing. There is now thrown upon the welding industry a needless burden due to the pres-

ent multiplicity of rules and specifications. It may be anticipated confidently that the coming year will witness great progress toward solution of this problem. Specification writers and users of welded products are showing more inclination than heretofore to prescribe the required quality of the finished work and to allow the manufacturer greater freedom in his choice of materials by which it is to be attained.

Indications of the general trend along this line are the latest American Welding society's Standard Qualification Procedure covering Process and Operator Qualification and Welding Symbols and Definitions which provide a universal welding language; the attempt to combine in one code the present A.S.M.E. and A.P.I.-A.S.M.E. rules, retaining the best and discarding the worst features of each; the effort to harmonize work of the American Welding society, American Standards association, and American Water Works association committees on welded steel pipes; and the steps recently taken to form a joint committee of the American Welding society and American Water Works association to prepare a code for large welded elevated water tanks.

## Correlation of Welding Research Makes Progress

BY G. F. JENKS*
Colonel, Ordnance Department, United States Army, Washington, and Senior Vice President, American Welding Society

■ PROBLEMS arising in an industry are an indicator of its expansion and progress. Current work on codes for qualification of welders and of processes, as well as for engineering structures, is a sign of healthy growth and extension of welding into new engineering fields. Increase in and correlation of welding research is another sign of progress, or, in other words, dissatisfaction with current conditions.

Judged from these two points of view, progress and trends may be summarized. Extension of field welding of important engineering structures has increased. Expansion of this section of the industry is limited by lack of technical knowledge of the role of certain elements in steel which affect its welding quality, of the properties of welded joints, and of internal stresses of joints. When more knowledge is available on these subjects and it is applied to production of materials, welding technique and inspection practice, we may expect further marked progress in welding of engineering structures.

Introduction of low alloy steels into the welding industries is proceeding rapidly. Railroad equipment and petroleum industries recognize the advantage of increased physical properties. In many fields the low alloys are being substituted because of the lower carbon content of these steels for given physical properties with consequent lesser difficulties in field welding. A better engineering practice and consequently more economical and wider use of these steels may be predicated with increased technical knowledge of them and of properties of the welded joint.

High alloy steels have proved successful in their application to such spot welded light-weight structures as high-speed trains. Use of these materials in aeronautical construction is still in the experimental stage. Modification of composition of some corrosion-resisting steels have eliminated some welding problems inherent in the older varieties available and have permitted economy by wider use of welding.

Perfection of nonferrous alloy clad steels, especially for improved corrosion resistance, has presented new welding problems, some of which are being solved. There is also an increasing demand for use of nonferrous metals for welded pressure vessels.

Some of the most spectacular developments have been accomplished in the field of resistance welding. With increased technical knowledge of fundamentals of resistance welding an increased competition of resistance welding with metallic arc welding in structures of medium section and an extension of use of spot welded thin sheets for light-weight, highly-stressed structures may be expected.

An important factor in the material progress of the industry is increased consideration given both to training of skilled workmen and education of the engineer. American Welding society has exercised constructive leadership in this field. Attention is now being focused upon training inspectors and upon courses given by colleges and engineering schools in welding engineering, and to application of welding in design of engineering structures.

*Released for publication by Chief of Ordnance, U. S. Army. Statements and opinions are to be understood as individual expressions of their author, and not those of the Ordnance Department.

## Special Alloys Finding Use in Pressure Vessels

BY E. R. FISH
Chief Engineer, Boiler Division, Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

■ THE PAST YEAR witnessed a continuation of the trend, begun several years ago, to use fusion welding for construction of pressure vessels for a great variety of services and through a wide range of sizes and pressures. Methods of welding are gradually becoming standardized so that there is not as much difference in quality of work turned out by various manufacturers as was previously the case.

While low carbon steel is still most generally used for pressure vessels, use of other steels and nonferrous alloys for special purposes is growing rapidly. Perhaps the most notable of these are the 18-8 chromium-nickel alloys in steel and the copper-silicon alloys in the nonferrous metals. These metals are admirably suited to special uses wherein their metallurgical characteristics contribute to long life and safe operation of vessels made from them.

Welding of these alloys, however, can be done satisfactorily only after thorough investigation into the methods required to assure sound welds of proper physical characteristics. Some manufacturers have

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been prone to assume that because they could do good work with low carbon steels they are perfectly able to adapt the same methods to alloy materials. Such adaptations cannot be made. However, most of the desirable alloys can be welded when proper technique is developed.

It is now generally recognized that only welders who have proved their ability to produce sound welds should be allowed to fabricate vessels, the safety of which is dependent upon integrity of the welds. Methods of demonstrating ability of welders are being simplified by a committee of the American Welding society, the methods being both simple and conclusive. This committee also has developed standardized methods for determining the sufficiency of any welding method to produce welds of the desired quality. Methods must be proved before being used in construction of pressure vessels.

Each year has witnessed substantial progress in welding methods and technique and this is accompanied by a continually growing confidence on the part of purchasers in welded construction.

## High-Frequency Welding Is a Late Development

BY C. L. HALPIN

Factory Superintendent,
Fruehauf Trailer Co., Detroit

■ WELDING occupies a distinguished and expanding position in the industrial arts. A study of the various processes indicates the diversification it has attained, furthermore, the study provides ample premise for the assertion that the art while greatly advanced and refined has not by any means reached the zenith of its possibilities.

Among processes, as presently classified and treated commonly, no place or discussion is given to a new development which is as yet in the laboratory stage, and which today is spoken of as "high-frequency" welding. This a joining of metals through use of an infinitely high-frequency electric current. A predetermined current, based upon the metallurgical content of the metals to be joined, of so high a frequency that when passed through two pieces of metal the resultant union has had relatively speaking no heat applied and depth of weld or penetration as is now required, and no thermal or mechanical distortion, yet obtaining a strength factor in the joint no different from that of the metals so joined.

This process may well early speed application of welding to a more valuable and useful degree of refinement in the design, fabrication, and use of metals far beyond generally thought possible at present.

American technical resource has contributed in a major way to the existing status of the welding art, and in no small part the credit is due to mass production activity, which by providing constant increasing factors of process, variety of product, and material volume, and which accompanied by a free and competitive privilege to improve in design, metallurgy, and technique, has literally summoned forth the ever-succeeding refinements occurring in welding. Industry is coming to recognize that rapid progress and valuable developments in welding equipment, materials, and processes, require that manufacturers be alert to adapt up-to-date welding processes as they become available. This is logical, proper, and in American industrial policy the usual thing.

A prominent manufacturer of welding equipment recently proposed to a large college, and the proposal is being considered seriously, that the college establish a separate and complete course in welding engineering. Briefly, this implies that welding as an art offers to students and engineers an established vocation in which they may specialize and one which will fascinate and challenge their efforts.

## Multilayer Gas Welding For Heavy Thicknesses

BY G. V. SLOTTMAN

Assistant Manager, Applied Engineering Department,
Air Reduction Sales Co., New York

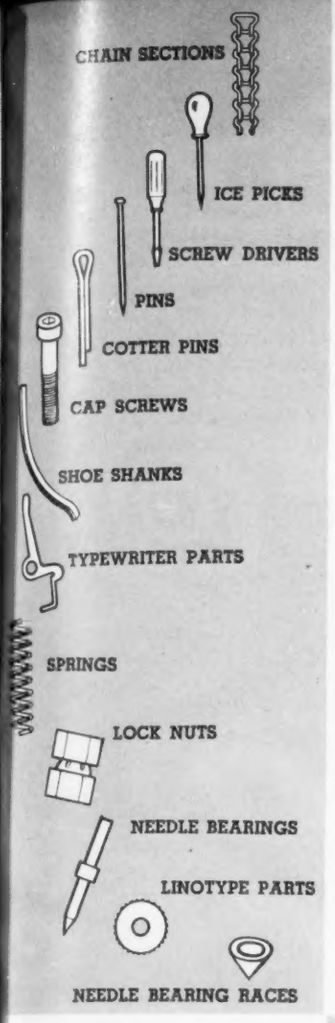
■ PROGRESS in oxyacetylene welding during 1938 has been marked not so much by startling developments as it has by widened use of the processes, in short, increased acceptance has been accorded the proven procedures. A brief review of the applications will be profitable.

Oxyacetylene welding rods next to the operator's ability, probably are the most important factor in sound welds. During the year alloy steel welding rods have been made available which will deposit welds with tensile strengths in excess of 60,000 pounds per square inch and ductilities well in excess of 20 per cent. Almost concurrent with this new rod has been development of a method for welding heavy thicknesses of steel, particularly pipe. In this method, the weld is made progressively in layers rather than a single operation—roughly a layer for each ⅛-inch thickness. Multilayer welding insures highest quality at lowered costs.

Welding of alloy steels presents problems, each of which requires individual consideration and solution. Carbon-molybdenum steel, used extensively for high-pressure high-temperature piping for its high creep strength and high yield point at elevated temperatures, has been under investigation recently to develop a suitable means for welding it by the oxyacetylene process. Preliminary test results indicate this steel is readily welded in all positions by established procedures. Welding followed by a simple heat treatment yields welds of physical properties equal to the base metal.

Bronze welding of steel is an old operation which finds increasing application. Where steel parts are to be joined with a minimum of heat, this method has distinct advantages. A new, liquid flux for this operation has been made available which yields bronze welds of higher quality and strength. Another feature of this new flux is its ability to reduce fumes, which always accompany this procedure, to the point where they practically are nonexistant.

Low-temperature brazing, a method of joining metals with alloys that melt at temperatures even

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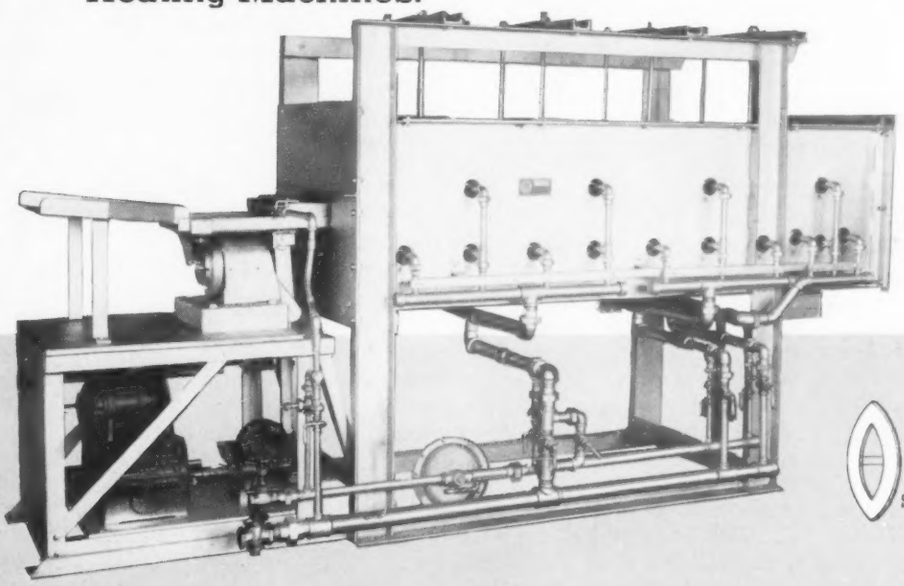

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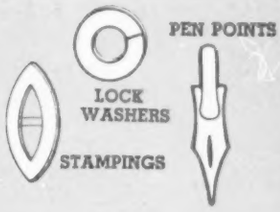


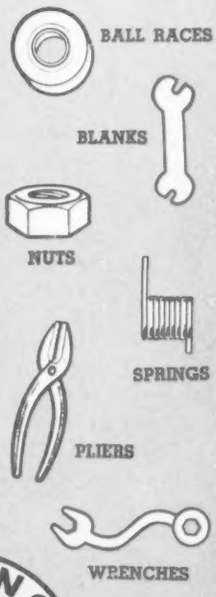


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lower than bronze welding rods, is finding increased acceptance. It is possible to make joints with these alloys with a minimum of distortion since the melting points range from 1175 to 1500 degrees Fahr.

One group of alloys with a copper base and containing phosphorus is suitable for nonferrous metals only. This group of alloys finds extensive application in the refrigeration industry. Another alloy containing silver, cadmium, copper and zinc, is suitable for joining ferrous and nonferrous metals. Its low melting point of 1175 degrees Fahr. makes it particularly useful in joining stainless steel. The low temperature and short time necessary to make a braze permit of joints which do not destroy the stainless properties of the steel. While these alloys are relatively high in cost, only a small amount is used in a joint, consequently they add but little to the cost of an assembly.

## Apply Automatic Welding To Alloys of Aluminum

BY G. O. HOGLUND
Welding Engineer,
Aluminum Co. of America, New Kensington, Pa.

■ THE WELDING art, as applied to aluminum alloys, has developed in two principal directions during 1938. Progress has been achieved in perfecting automatic equipment for both fusion and resistance welded parts, and better control of the result is obtained by establishment of qualifications tests for both welding process and operator, particularly in the field of torch and arc welding.

Since the last analysis of welding progress in aluminum, wider application of aluminum metallic arc welding has been made. The first automatic set-up for fusion welding aluminum parts has been developed to assemble beer barrels. Shape of this package makes it an ideal application for automatic welding equipment. The barrels are fabricated from heat treated aluminum alloy, and welding is accomplished with a carbon arc utilizing a superimposed alternating-current field around the arc. Superior results—comparing strength and soundness of the present arc welded barrel with the earlier torch welded barrel—have been obtained, and a substantially accelerated welding rate is achieved. Further experimentation, which has not actually reached the production stage, indicates that atomic hydrogen also can be adapted to automatic welding.

With further reference to metallic arc welding, a number of articles, which required good resistance to impact and vibrational loading, are assembled by welding. Typical examples are parts for power shovels. These are joined by the metallic arc and heat treated after welding. A welded dump truck body made from a heat treated aluminum alloy appears to be satisfactory after six months' service. Although welding is not yet generally used to assemble structural parts of the type described, tests during the last few years indicate welding will be used more frequently for this purpose in the near future.

Resistance welding has expanded considerably in actual production. Automatic equipment for spot welding electric refrigerator parts has been made and used in production. The aircraft industry, with increased manufacturing schedules, is particularly interested in use of welding to reduce relatively high costs. As aluminum alloys are used copiously in this field, practically all fabricating companies have obtained resistance welding equipment and are developing shop technique and designs for spot welding airplane parts by means of resistance welding. It is also a sign of progress to note that manufacturers of this type of equipment are now in a position to produce it and to guarantee results for aluminum alloys.

The butt or flash welding process for aluminum alloys also has made headway. Typical examples include joining of washing machine parts, ski pole rings, and wire and thread reels. Aluminum can be welded to copper by means of this process. This type of joint is used in certain electrical circuits on electric locomotives, where lightness of aluminum is desirable in reducing centrifugal forces in rotating parts, with the consequent necessity of joining these aluminum parts to the copper distribution system installed in the train.

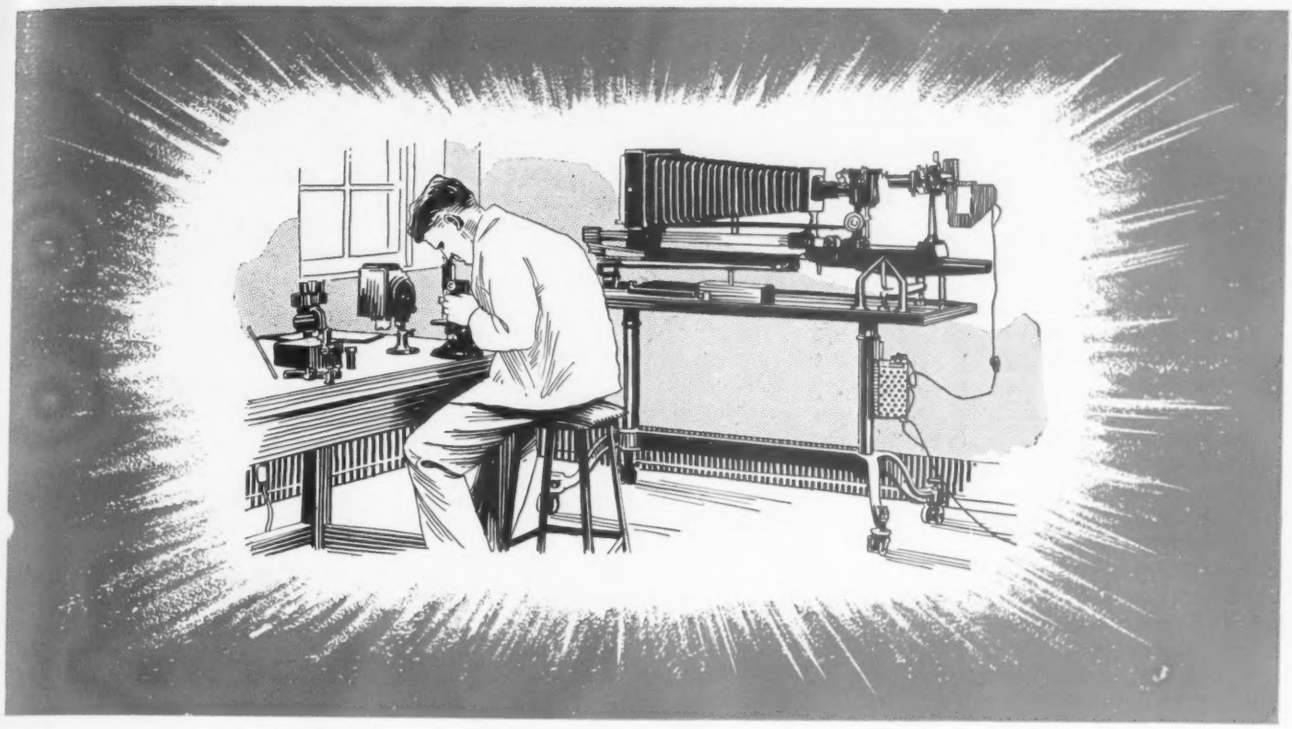
Most of the chemical, dairy, truck tank, and brewery equipment made of aluminum is still fabricated by fusion welding with a torch. While outstanding developments in this field have not been apparent, the process has been extended to manufacture of extremely large field vessels. Bubble towers and stills of sizes exceeding any hitherto manufactured were produced the past year. Success achieved in making such parts probably can be attributed in large measure to the better control in fashioning the welds.

Suitability of aluminum in handling of certain chemical and food products has brought about the growing demand for equipment made from this metal, and the cause of aluminum has been additionally furthered by the fact that many fabricators are beginning to realize that this type of business is desirable.

## Reviews Work on Welding Of Copper-Base Alloys

BY J. R. HUNTER
Welding Engineer,
Revere Copper & Brass Inc., Rome, N. Y.

■ PROGRESS in welding copper-base alloys in the past year has been characterized by continuing study and development rather than by outstanding single accomplishments. A report of preliminary work done on spot welding characteristics of some copper-base alloys in connection with the program of the copper alloys subcommittee of the American Welding society's welding research committee has contributed valuable and specific information. It has also indicated the necessity of additional investigation and the general course which further detailed investigation should take. An improved method of evaluating dif-



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ferences in weld metal quality has been developed as a consequence of the work of the subcommittee.

The committee's survey of the literature to January, 1937, remains the most complete contribution to the general knowledge on welding copper-base alloys. A summary of the best-known methods and practices has been embodied in the copper alloy section of the American Welding society's newly published *Welding Handbook*.

No material progress has been made in welding copper. There have been no substantial contributions to existing knowledge in this field, although a report of progress in copper welding by the copper alloys subcommittee is expected shortly. The chief obstable to successful copper welding is, of course, the high thermal conductivity of the metal.

Considerable interest has developed in welding cupro-nickel as a consequence of the recent use of these alloys in construction of condensers and heat exchangers. While the cupro-nickels have been used for some time in the manufacture of condenser and heat exchanger tubes, application of the alloys to tube sheets and for use in water box construction has only recently created the need for an established welding technique.

In the copper-base alloy field the silicon alloys continue to find preference where welding operations are necessitated. Definite carbon arc welding procedures have been published and the methods established enable any reasonably competent welder to meet the requirements of paragraph U-69 of the specifications of the A.S.M.E. Unfired Pressure Vessel Code.

Importance of fluxes and rod coatings in welding copper-base alloys is becoming increasingly recognized. Coated copper-base electrodes are offered commercially, but there is a considerable degree of variation in the results obtainable with various products of this type. The coated electrode has not been perfected to the same degree that it has in the ferrous field. A development of interest has been that of a method of adding liquid flux through the gas flame when gas is used for bronze welding or brazing.

## Use Welded Construction To Effect Weight Saving

BY A. J. MOSES

General Manager, Hedges-Walsh-Weidner Division, Combustion Engineering Co. Inc., Chattanooga, Tenn.

■ A FURTHER tendency toward use of all grades of alloys, including low-alloy steel, for higher tensile strength and better corrosion resistance has been witnessed during the past year. High alloy steels and nonferrous metals are becoming increasingly more popular.

Industry is especially taking advantage of the high chromium and chromium-nickel alloys for resistance to oxidation at high temperatures. Low-copper molybdenum steel also is being substituted frequently for carbon steel, on account of the better corrosion properties of the former.

Steel manufacturers generally are using more scientific methods in the control of baths and grain size, so that the quality of their product is improved considerably. This has been brought about undoubtedly by closer inspections and rejections of materials. It is the writer's understanding that the automobile industry is now ordering steel in some cases to grain size and also to maximum nonmetallic inclusion specifications.

Welding is being extended to all manner of construction. Where applicable, considerable weight is being saved through its use. This applies to the construction of machinery, ships' hulls, buildings and bridges. During the past year, knowledge of metals and alloys has increased greatly and a more intelligent application is being made toward using the most economical material in various types of design for engineering structures.

## Higher Speeds Realized In Oxyacetylene Welding

BY A. B. KINZEL

Chief Metallurgist, Union Carbide & Carbon Research Laboratories Inc., New York

■ OUTSTANDING developments of the year in fusion welding center around the realization of greater welding speeds, and higher quality of work, as well as lower costs.

The Unionmelt welding process, a new electric welding method, is being used by metal fabricators for its speed, simple operating procedures, and high-quality welds. Use of oxyacetylene multiflame heads has been greatly extended in pipe line work, deep-well castings for oil and gas wells, and in specially designed production welding machines. Oxyacetylene flame hardening and flame softening provide practical and economical methods of meeting metallurgical specifications of hardness or ductility.

The Unionmelt welding process is an automatic method of making butt welds, fillet welds, and plug welds of exceptional quality and high strength in any commercially used thickness of steel. High-quality butt welds can be completed in one pass at the rate of 10 to 12 inches per minute in 1-inch steel plate, and at the rate of 5 to 6 inches in 2-inch plate. The process saves time and material, and speeds production of fabricated products.

This method is an electric process using the heat generated by the passage of an electric current from an electrode to the work. End of the electrode is constantly covered by a highly resistant, conductive medium applied as a special granulated material. This granulated material is laid down along the seam to be welded, and the entire welding action takes place beneath it, without an open, visible arc, and without sparks, spatter, smoke, or flash.

The process is already being widely used commercially in many fields—for fabricating ships, barges, railroad cars, locomotives, engines, pipe, tanks, pressure vessels of all types, caissons, annealing boxes, large machinery parts, and special assemblies for a variety of uses. Automobile parts, small machin-

ery frames, structural shapes, special pipe fittings, and many of the smaller items produced in considerable quantities also afford practical application for this automatic process.

Introduction of the new four and six-flame heads for pipe welding by the Lindeweld process has increased welding speed as much as 50 per cent as compared with single-flame welding heads. Due to the more efficient application of heat accomplished by the multiflame heads, smaller vees can be used, which considerably reduces the time and quantity of welding rod. Multiflame heads also facilitate welding of industrial piping and of deep-well casing for oil and gas wells.

Mounted in specially designed machines, multiflame welding heads, with from three to ten flames, are used for automatic production welding of steel barrels and drums, and other products. Metal surfaces to be welded are automatically lined up and fed into the preheating and welding flames at the proper speed, which can be regulated according to the thickness of metal. Welding rod is automatically supplied continuously. Some of these welding machines have made it possible to perform a welding operation as much as three times as fast as by welding with the hand blowpipe.

Value of the oxyacetylene flame as an agent for the locally applied heat-treatment of certain kinds of steel has become well established in the past year. This operation is closely related to fusion welding and gas cutting through both the metallurgical aspects of the processes and the equipment and heating media used. Flame hardening is a process whereby the surface to be hardened is brought to a prdetermined heat by means of the oxyacetylene flame and then immediately quenched. A hard case is imparted to the steel surface without altering in any way the chemical composition of the iron or steel.

Flame softening is used for counteracting the hardening effect of oxyacetylene cutting on certain steels, such as the low-alloy high-strength structural steels. In this process, multiflame heating heads are used, either ahead of or following the cutting nozzle. By means of the well-distributed heat, the quenching action of the cold base metal is reduced, and speed of the air quench is retarded, thus making it possible to cut these structural steels without impairing physical properties of the cut surface.

Flame softening and flame hardening are similar in that they both constitute a localized and progressively applied marginal heat treating operation effected by means of multiflame heating heads. In purpose, however, they are practically opposites, for flame hardening is dependent upon the fact that most steels harden when cooled rapidly from temperatures above the critical point. Flame softening, on the other hand, depends upon the fact that most steels are relatively soft when (1) annealed from above the critical point, or (2) tempered below the critical point.

Flame hardening is particularly suited to applications where a hard surface with a tough ductile core or body is desired. It is possible to vary the depth of hardness from 1/16 to ⅜-inch. Various degrees of hardness are obtainable from 300 to 700 brinell. The hardening of wearing surfaces on steel parts that would be difficult, costly, or impossible to heat treat by other means is readily done by flame hardening. Materials suitable for flame hardening include a wide range of carbon and alloy steels, and cast iron. Typical applications include gear teeth of all sizes, cams and camshafts, mill rolls, crane and sheave rolls, dies, valve stems, and similar parts.

More important applications of the flame softening process are: Softening flame-cut edges of high-strength steel gusset plates and web plates used for the construction of buildings and bridges, preparing structural plates for railroad cars, finishing and cutting high-strength steel products in steel warehouses, finish treating carbon steels of 0.40 per cent carbon or higher in steel mills to prevent cracking or to permit finish machining.

# Wire Drawing Breaking Away from Its Traditions

BY KENNETH B. LEWIS
Consulting Engineer,
Worcester, Mass.

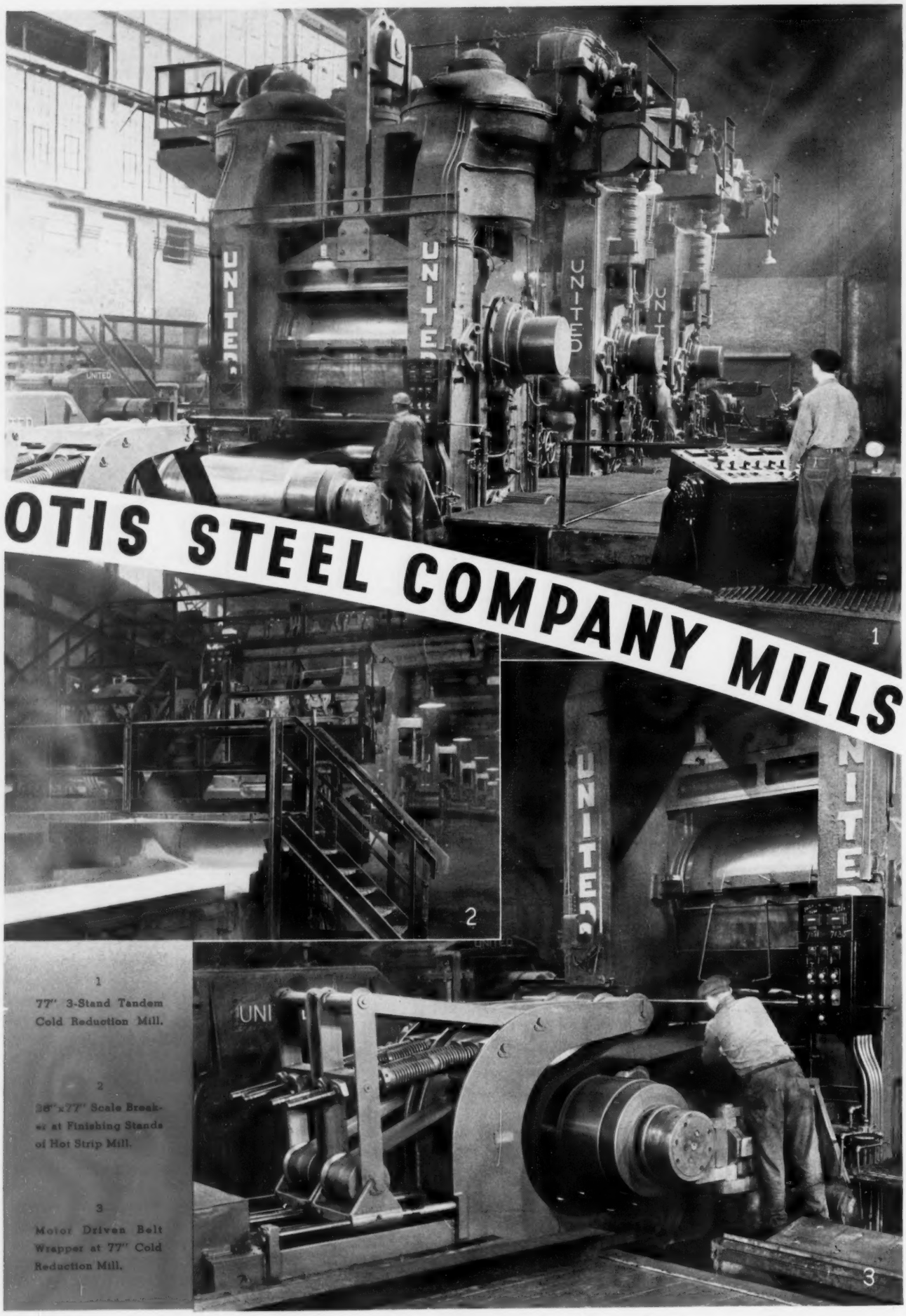
■ WHEN the present generation took over the art of wire drawing they found it in mighty good shape so far as results were concerned, but, in its methods, a mixture of empiricism and tradition. Some traditional practices are so firmly rooted in fundamental verities of plastic flow that we marvel at the patience and intuition that worked them out. Others were rooted only in conditions and practices that had long since faded out. Our chief task is to separate valid from invalid traditions, and every year sees progress. We may or may not make better wire than our predecessors, but we certainly make it more consistently. In today's market, you can't miss many bullseyes and live.

In the cleaning house the flash baker, which last year upset most of the baking traditions, continues to extend its field. The trend toward straight-line operation continues. Another awkward detail has been challenged, namely, the steam injector. In many mills the only function of the boiler plant is heating acid baths. Low-pressure steam used for heating buildings condenses in too great volume, causing overflow and loss; high-pressure steam involves licensed operators. In either case, enormous peak loads are embarrassing. Submerged combustion is now being used to heat acid baths, with promising results.

In the wire room the trend toward continuous drawing gathers force. There is also increasing appreciation of the value of rapid cooling of wire in process, especially as it affects properties of the finished wire. Control of finish is getting more precise.

Hot galvanizing, under stress of competition from various electric processes, continues to gain in flexibility and control, but no quick test has yet been evolved that simulates the life test. The British postoffice, a tremendous consumer of galvanized wire, is unable to decide whether weight of coating is more important than its flexibility, reporting in effect that for each application there is a differential ideal relationship, but the pendulum seems to be swinging slightly toward heavy coatings.

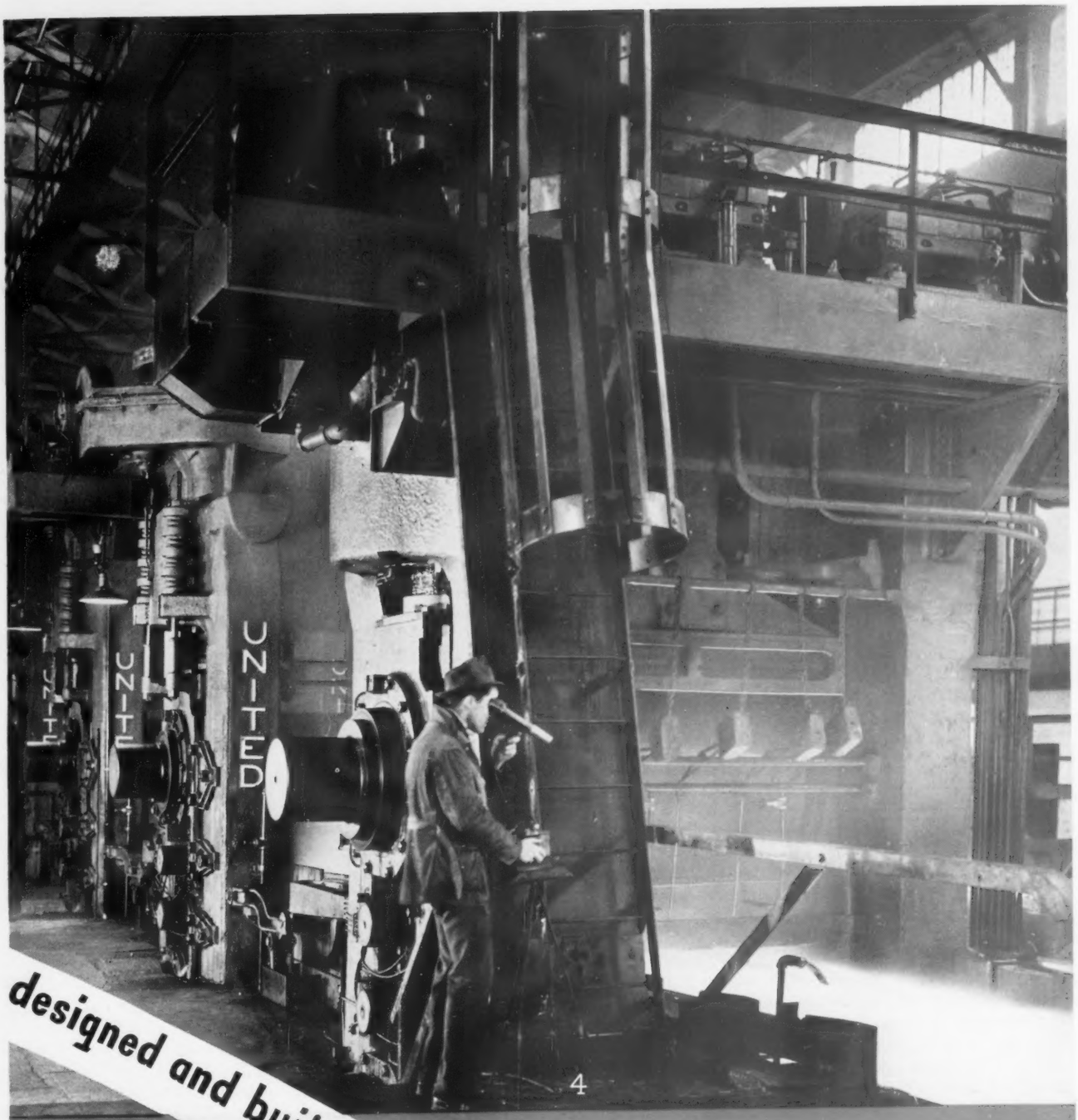
It is seldom that a report of progress is able to make reference to the nail mill, but a process re-




1
77" 3-Stand Tandem Cold Reduction Mill.

2
26"x77" Scale Breaker at Finishing Stands of Hot Strip Mill.

3
Motor Driven Belt Wrapper at 77" Cold Reduction Mill.




4. 77" Continuous Hot Strip Mill—Delivery End.

designed and built by

# UNITED

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cently patented and in commercial operation is worth notice. A small inexpensive wire drawing machine feeds its product direct into the nail dies. Savings are made, the amount being naturally in dispute, but it is beyond dispute that in the first few seconds after drafting, steel wire is vastly better conditioned for further plastic flow that it ever will be again. Heading dies have a longer life and larger heads can be made safely on wire which has scarcely begun to age harden.

The spotlight of criticism is about due to be turned on the rod mill. The utmost refinement of skill in the wire mill is wasted on rods with seams, laps, guide scratches, and other defects. It is true that the billet mill, the blooming mill, and factors further back enter this equation, but beyond question the rod mill always is a potential mutilator of steel. Swedish rods imported in large tonnages by wire mills are not bought for their analysis alone, but for their soundness and good surface. There is a field for a rod mill that will produce Swedish quality at American costs.

# Control of Steelmaking Assures High-Grade Wire

BY FREDERICK A. WESTPHAL

Superintendent of Wire Mills,
Sheffield Steel Corp., Kansas City, Mo.,
and President, Wire Association

■ WITH operating men, engineers and metallurgists in the wire industry constantly on the alert for betterment of finished product, progress is developing principally in seven directions. Briefly, these may be listed as follows:

1. Metallurgical and metallographical research is bringing about a closer control over steelmaking processes, and all subsequent rolling operations from ingot to finished rod. Thus, steel quality is improved and held more uniform. Similar progress is being made in connection with nonferrous metals to be made into wire.

2. New developments in materials handling systems are promoting safety and efficiency of operations, with a consequent saving in labor and costs. For instance, straight-line cleaning is definitely the trend, with the tanks and equipment taking full advantage of acid-resisting materials.

3. Machinery design is definitely established for continuous drawing for multiple drafting of ferrous (both high-carbon and low-carbon steel), nonferrous and certain alloy wire. Speeds for finishing wire are still increasing without sacrifice of quality and with definite inherent savings in conversion costs. No one knows how far this can go.

4. Faster speeds in drawing are being attained through use of tungsten carbide dies. In addition, finishes and physical properties of wire have been improved through use of the sintered carbide dies.

5. Billet and rod mills are rolling heavier weight billets and coils of rods, which means increment loads and weights of single units for processing through wire mills are vastly larger. Material handling systems make this particular phase possible, but it will be temporarily "blocked out" until wire consumers become cognizant of the importance of heavier weight coils and subsequently install equipment for handling the heavier coils of rods and wire that can be supplied them. The future may see demand for 2000 or 3000-pound continuous-length coils of rods.

6. Development of "flash baking" was a most progressive step in the essential operation of correctly baking rods and wire. The new type baker not only saves a tremendous amount of time, but is easily installed in straight-line cleaning as well as in the old circular-type cleaning layout.

7. Electric welders for butt welding lengths of rods and wire together have given to the wire industry a successful means for achieving efficiency in drawing. They also have made possible the heavier coils of finished wire, with a consequent improvement in yields in processing through to finished wire products.

These seven directions of progress are only part of the wire industry picture. Every wire producer works out individual developments from year to year as perplexing problems present themselves and call for resourcefulness in finding solutions.

# Wire Mill Modernization Resulting in Economies

BY B. L. McCARTHY

Chief Metallurgist,
Wickwire Spencer Steel Co., Buffalo

■ PROGRESS in the wire mill continues along the lines of modernization of old processes and more economical methods of material handling. Continuous drawing machines employing higher speeds are gradually replacing single-draft drawing benches and improvements in quality because of better cooling are being noted.

In the heat treatment of wire, more advanced knowledge of metallurgical features combined with improved furnace design enables the wire manufacturer to so condition the steel as to make quality more positive. Greater uniformity in low carbon annealed wire to fit faster and more accurate forming requirements has directed attention to the need of continuous annealing or perfection of heating conditions associated with batch annealing.

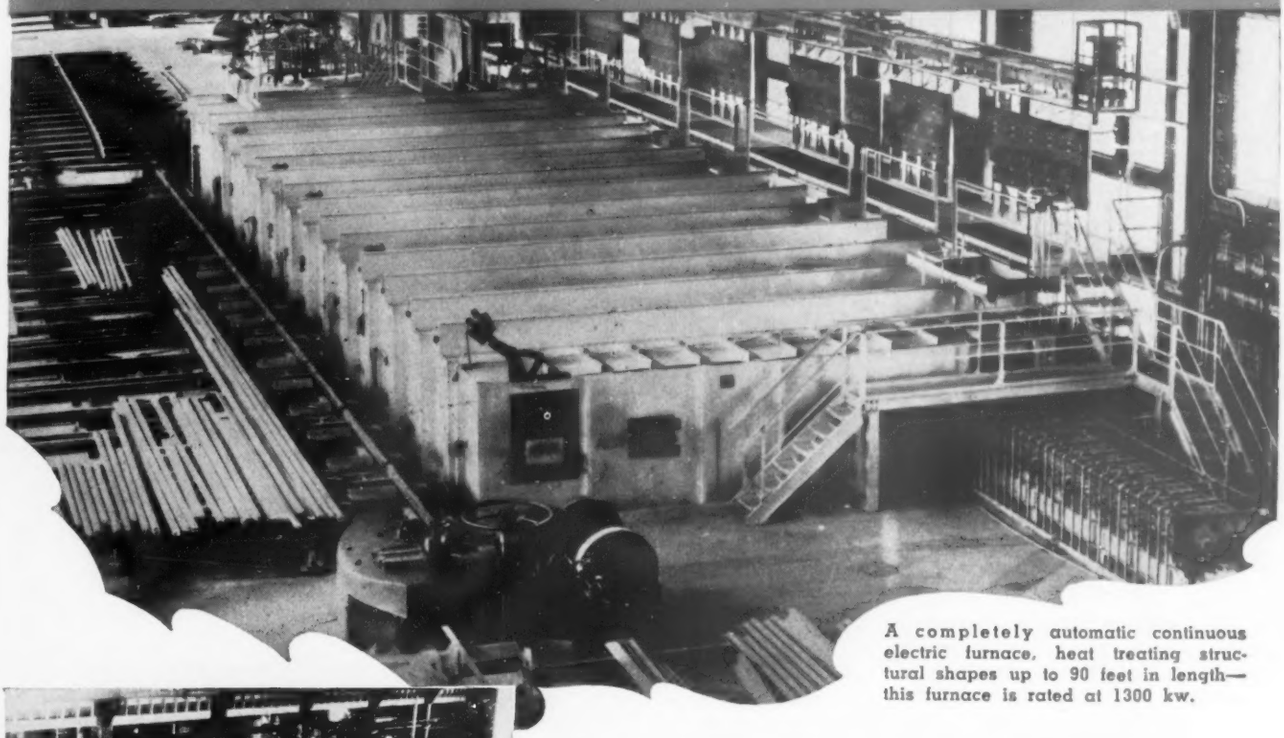
Application of faster electrolytic cleaning methods to continuous heat treating operations seems to hold the stage today and indications are that more economical methods for heat treatment and cleaning by combining the two will result.

Use of tungsten carbide dies has become accepted practice, dies of this material being almost universally employed.

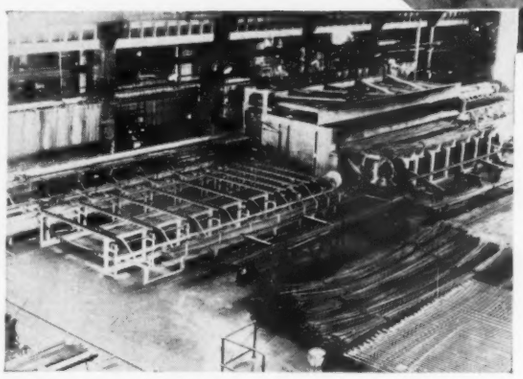
Effort to eliminate lime, for neutralizing the acid and providing a vehicle for wire mill lubrication, by use of substitutes is meeting with questionable success. Introduction of pulverized lime which can be slaked as used, has been introduced in the last few years and is meeting with general approval.

Use of a faster baking device for baking acid-

# WE *Specialize* IN DESIGNING AND BUILDING *Special* FURNACES FOR *Special* PURPOSES



A completely automatic continuous electric furnace, heat treating structural shapes up to 90 feet in length—this furnace is rated at 1300 kw.



A gas fired heat treating furnace, quenching machine and rod straightener—handles sucker rods up to 30 ft. long.

## NO JOB IS TOO LARGE OR TOO UNUSUAL!

The Electric Furnace Co., because of its great number of successful, large and unusual furnace installations, has justly earned an enviable reputation for solving difficult production furnace problems.

The two furnaces shown on this page are typical examples—the large aluminum furnace shown above is completely automatic—large structural shapes up to 90 ft. in length are automatically charged into the furnace, carried across the heating chamber and discharged through a spray quench—everything automatic.

The heating chamber is 93 ft. in length by 26 ft. in width and despite its unusual size this furnace maintains a uniform temperature throughout the entire heating chamber. To our knowledge this is the largest furnace of this type ever built for this purpose.

The furnace shown at left is another outstanding installation—this equipment heats, quenches and straightens rods up to 30 ft. in length and was the first successful continuous furnace of this type built for this process. Several somewhat similar installations have since been made.

If you have a difficult production furnace problem put it up to our experienced engineers—No job is too large or too unusual.

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# The ELECTRIC FURNACE Co.

*SALEM, OHIO*

GAS FIRED OIL FIRED
AND ELECTRIC FURNACES

FOR ANY PROCESS,
PRODUCT OR PRODUCTION

cleaned wire and rods continues to increase and indications are that the slow baking process, requiring hours where the newer method requires minutes, is destined to be replaced.

In general, the last few years have brought many changes in equipment and processes in connection with the manufacture of steel wire and indications are that this development will continue.

# Wire Makers Now Attack Surface Imperfections

BY H. C. BOYNTON
Metallurgist,
John A. Roeblings' Sons Co., Trenton, N. J.

■ SINCE wire may inherit the ingot's defects, the manufacturer's mandate is to eliminate the defects before the steel is fabricated into wire. Keen attention formerly was focused on ridding steel of internal flaws, now equal attention is devoted to surface imperfections.

Considering stages in manufacture from ingot to wire, the trend in hot mills is toward soaking pits with automatically controlled temperatures and atmospheres; this control also applies to rod mill reheating furnaces. Many mills roll standard 30-foot billets about 2 inches apart, and at least one mill, to make different sized rods, is varying this cross section from about 1¾ to 3 inches square.

Most modern rod mills use alloy steel guides and high-speed finishing stands. One mill rolls at about 4000 feet per minute, which is 46 miles per hour. With such speeds, maximum temperature variation between front and back ends rarely exceeds 300 degrees Fahr. Some use descalers, others are regulating temperatures and removing part of the scale by spray water quenching.

By employing the straight-line method of rod handling in cleaning, one manufacturer is able to pickle, wash, sull and bake 420 tons of rod per 24 hours at a labor cost of 11 man-minutes per ton; if sulling is omitted, at 8 man-minutes.

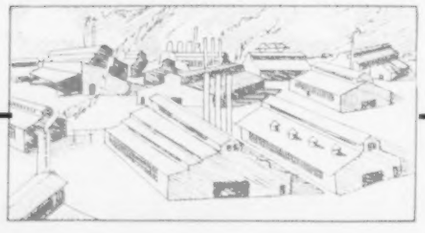
Use of carbide dies is almost universal. To lower costs, manufacturers buy "rough cored blanks" and "rough drilled nibs" and do their own finishing and reboring. Water-cooled blocks are appearing, as well as air cooled. One user claims he produces high-grade spring wire, No. 19 gage, at 400 feet per minute with slight sensible heat after three or four laps are coiled on the water-cooled drum. It is alleged that such cooling greatly enhances physical properties.

Heat treatment to produce bright wire progresses rapidly. Many furnaces are custom built with atmospheric control suitable for the material. Furnaces are obtainable for strip or round wire, for treating single wires or whole coils; they are supplied in the bell-type, round square, rectangular or tubular types, for electricity, gas or oil. If gas, some have multiple refractory burners, others burn the gas in radiant tubes. Some new furnaces are controlled by thermocouples inserted in the charge.

Hot galvanizers, confronted with the rapid strides made by electrogalvanizers, are now improving their product by better pickling, washing, drying and fluxing, also by using faster speeds in larger and deeper pans. This is resulting in a vastly improved zinc coated product. Costs are cut by blanketing, checking radiation 35 to 50 per cent, and lessening formation of zinc oxide.

Research is busy experimenting with back pull, which means stressing the wire before it enters the die; power consumption remains the same but die pressure is reduced. For example, when back pull of 500 pounds is applied, die pressure of 400 pounds drawing an 0.098-inch wire with no back pull, becomes 120 pounds.

One laboratory is determining how damaging drawing scrapes, seams, etc., are to physical properties, particularly endurance limit, and claims the shape or contour of a scrape is more important than actual depth. A drawing scrape is not nearly as damaging as an inherent seam or lap.



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The TITAN METAL MANUFACTURING COMPANY is devoted exclusively toward the improvement, manufacture and distribution of brass and bronze products. TITAN products are well known to many manufacturers, because when brass or bronze forgings are specified, they think of TITAN. If TITAN makes it, the user knows that it will resist chemical corrosion and the wearing effect of shock loads. In an area bounded by Hartford, Detroit, Rochester and Richmond live 40,000,000 people. Bellefonte, Pa., is the center of this area, and it is in Bellefonte that the TITAN mills are located. Ideally placed to serve many, TITAN brass and bronze products have built up an enviable reputation. Special requirements and special schedules are but two examples of flexible service. Before you place your next order, let TITAN quote you prices.

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| Hot Rolled Strip Sheets | Galvannealed Sheets | Formed Roofing and Siding | Alloy Coated Tin Mill Black |
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# GRANITE CITY STEEL COMPANY

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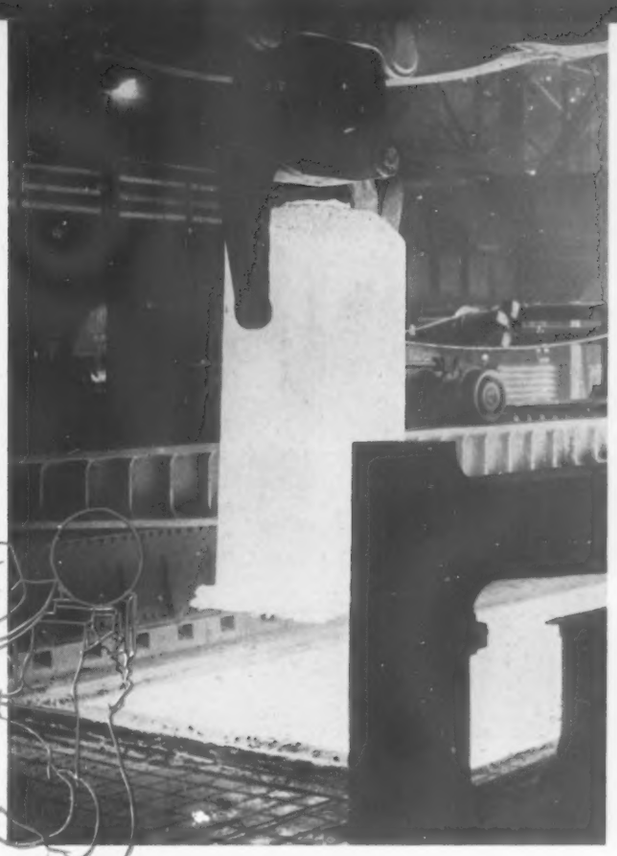
NOW OPERATING ONE OF THE LARGEST CONTINUOUS MILLS IN THE UNITED STATES

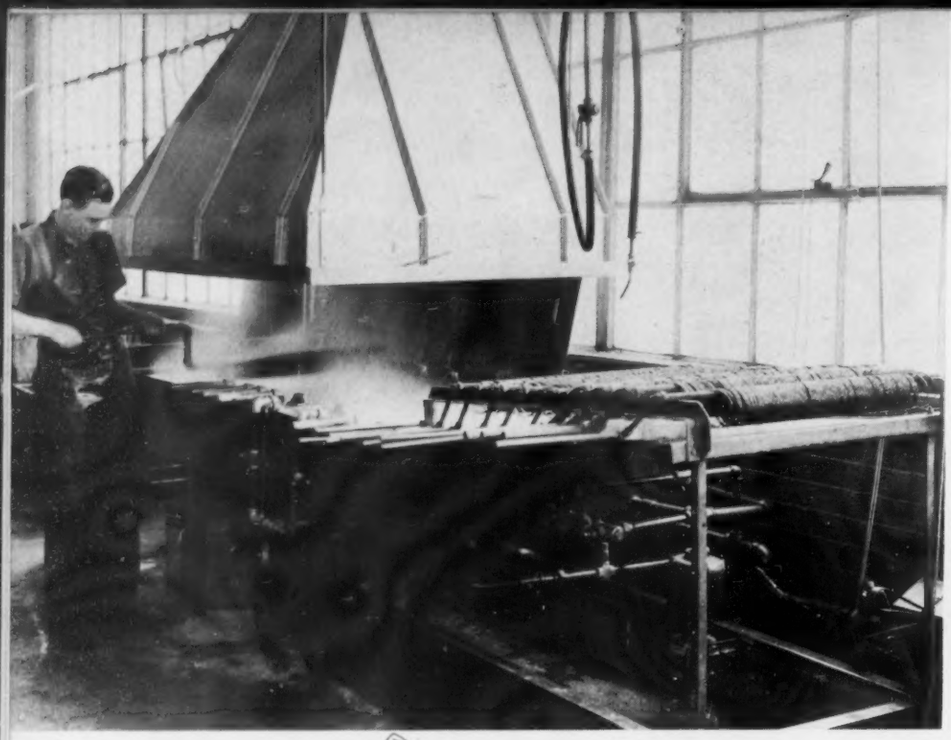
# PROGRESS as seen in *Pictures*



■ Perfectly heated ingots are a requisite to rolling good steel. The ingot shown above is being removed from one of the soaking pits of the Jones & Laughlin Steel Corp., Pittsburgh. The pits are equipped with automatic combustion control developed by the Hagan Corp., Pittsburgh

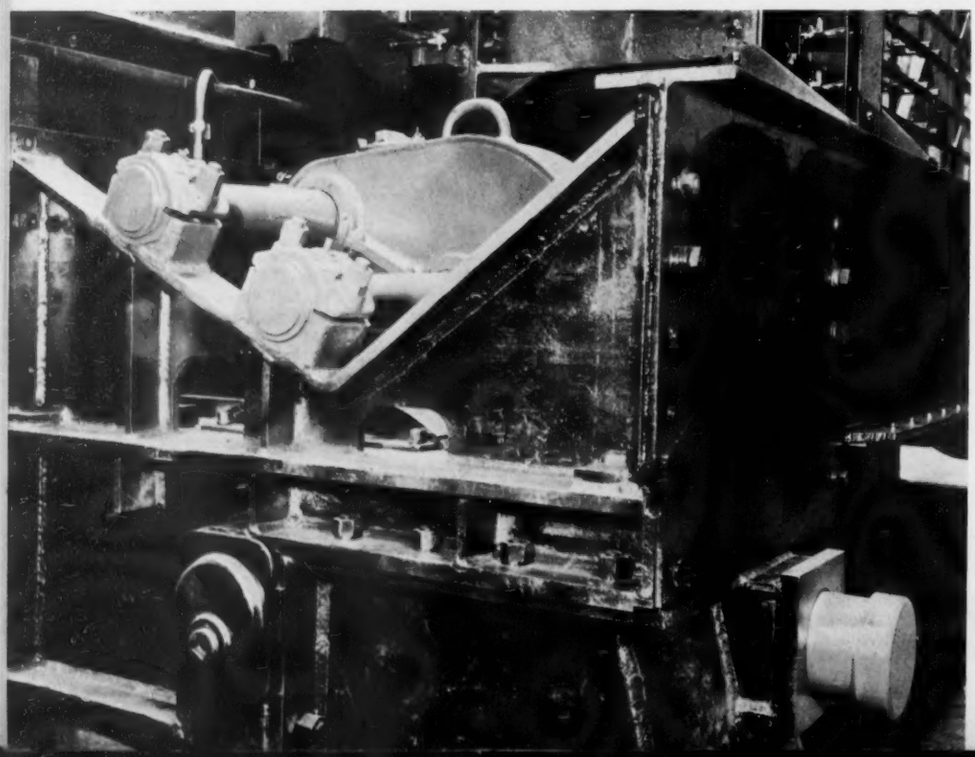
■ Steel cutting with cemented carbide increases. Two Carboloy tools removed from this 62,400-pound steel casting 612 pounds of metal per hour at 35 feet per minute, 1/16-inch feed per revolution, ¾-inch depth of cut. Photo courtesy Carboloy Co. Inc., Detroit

■ Fabrication of structural steel assemblies by riveting is speeded up appreciably when mechanical means are employed for removing the temporary holding bolts. In the illustration above, workmen are removing the bolts from an unusually large steel column with pneumatic impact wrenches. These wrenches are a product of Ingersoll-Rand Co., Phillipsburg, N. J.



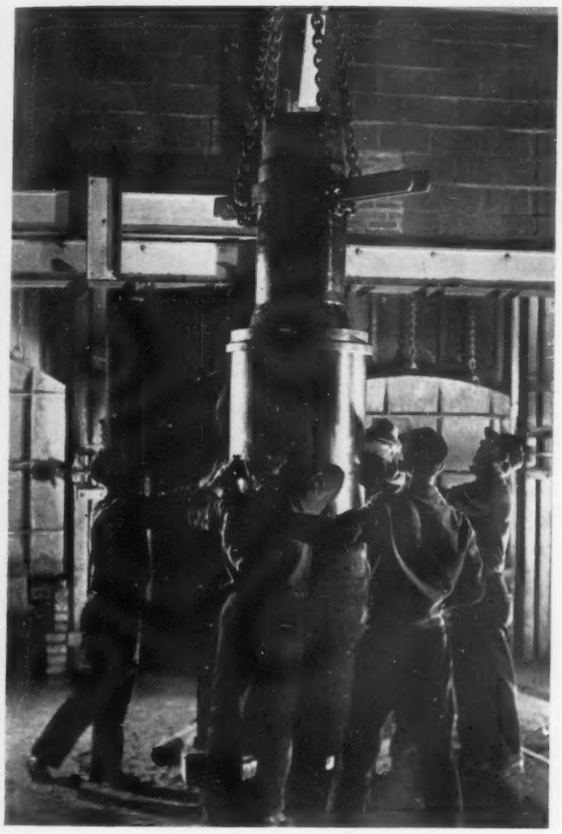
■ Chemical surface treatments on iron and steel automotive engine parts are proving amazingly effective in reducing wear, scuffing and scoring. At the left is the Granosealing equipment employed by Sealed Power Corp., Muskegon, Mich., for applying a manganese phosphate coating to piston rings. The chemical used is Granodine supplied by American Chemical Paint Co., Ambler, Pa. Bath is held at 210 degrees Fahr. and rings are immersed in it for a period of about 10 minutes

■ Because of their remarkable castability, zinc alloys are finding increasing use in the production of die castings of thin section. The three-piece bicycle housing, shown at the right, weighs only 22 ounces, despite its 13 x 8 x 4-inch size. Metal thickness is only from 0.024 to 0.030-inch. Note the sharpness in detail of the parts. Fastening lugs and bosses are cast integral. Photo courtesy New Jersey Zinc Co., New York



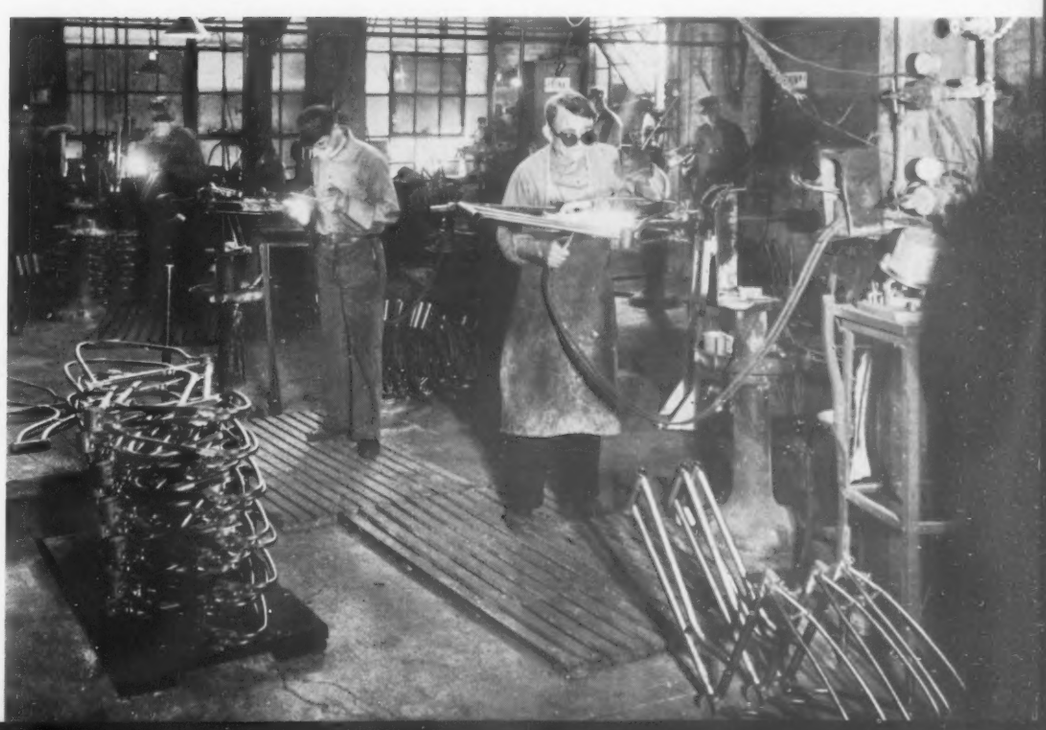
■ The important part being assumed by welding and cutting in construction of heavy equipment is demonstrated in this view of the corner of an end carriage for a low-type open-hearth charging machine of 12-ton capacity—the largest built. Wellman Engineering Co., Cleveland, was the builder. The end carriage was designed to withstand the enormous stresses imposed on these machines. Note the heavy fillet welds and smooth contours free from undercutting

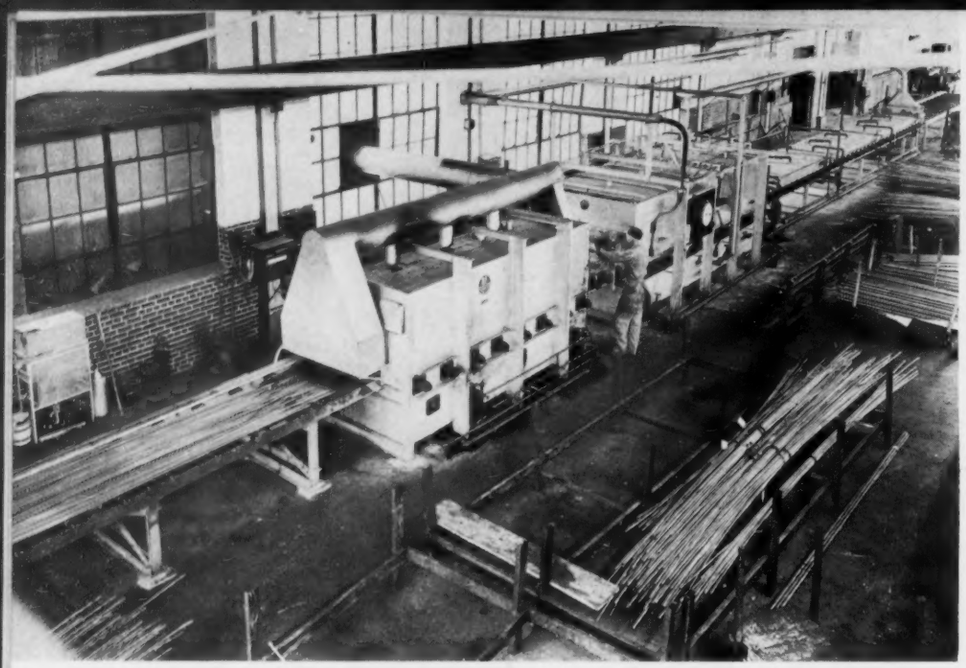
■ The shop of the Heppenstall Co., Pittsburgh, affords the photo (below) showing the interesting operation of shrinking a roll sleeve onto a back-up roll for a continuous hot strip mill. The process, which is growing in favor rapidly, consists in salvaging the original cast steel back-up rolls supplied with the mill and shrinking on hardened forged steel sleeves. Accurate records of forged sleeves are said to indicate life many times greater than for solid cast rolls



■ Emerging from the enameling furnace (above) in the plant of the Pfaudler Co., Rochester, N. Y., is a 30,000-gallon glass-lined steel brewery tank 40 feet long and 11 feet diameter. Of all-welded construction from ½-inch plates, the tank is as large as can be shipped by rail. The glass lining is applied in the form of enamel coats which must be fused by heating

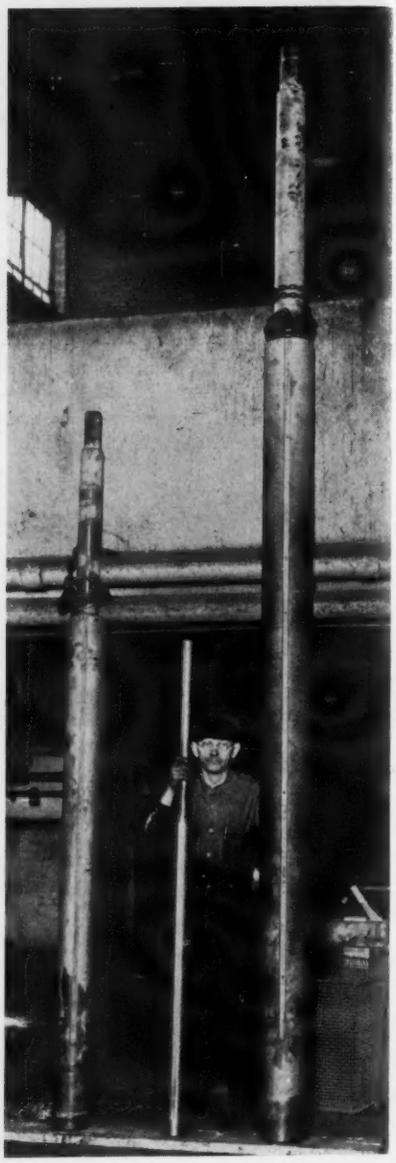
■ Bronze welding of bicycle frames in the plant of the Colson Co., Elyria, O., is facilitated by inducting liquid flux directly into the gas line and discharging it through the torch tip with the flame. The flux and automatic equipment for introducing it into the gas line are manufactured by the Automatic Gasflux Co., Cleveland. Standard torches and tips are used in the process

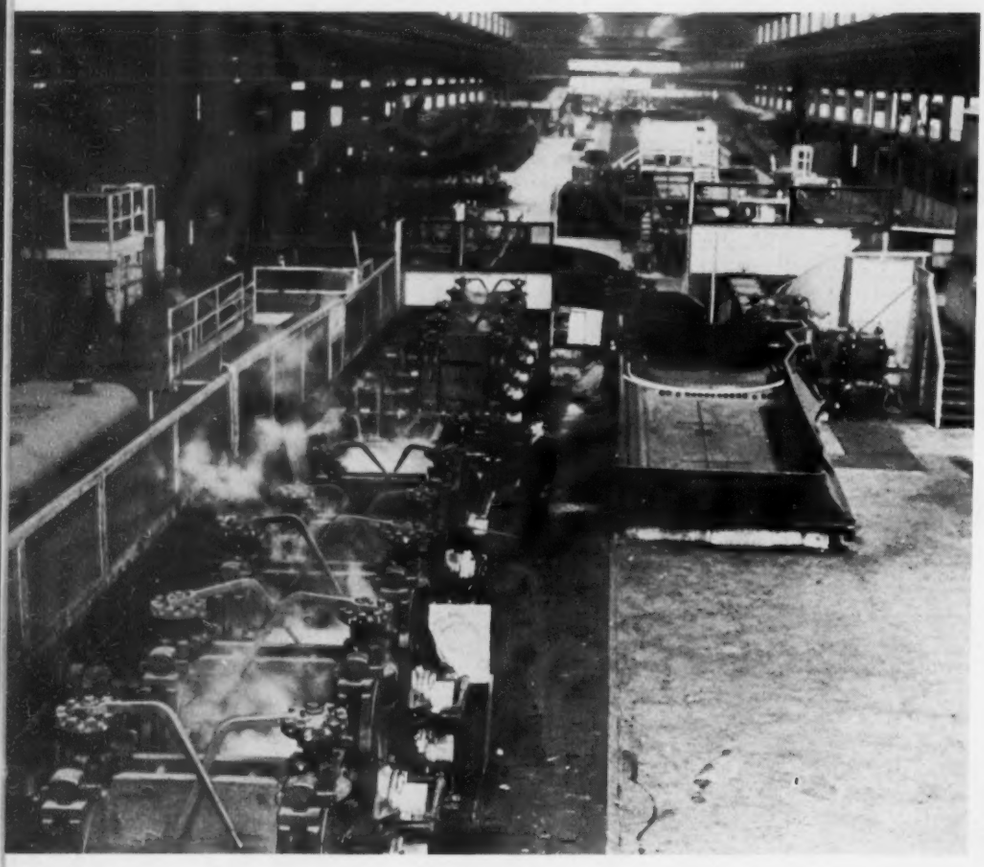




■ High carbon seamless steel tubing for golf shafts, at the rate of 2000 pounds per hour, is bright annealed uniformly and continuously in the controlled atmosphere furnace shown above. This unit, built by Electric Furnace Co., Salem, O., handles tubing in any diameter or length at temperatures from 1250 to 1750 degrees Fahr.

■ View of new continuous rod and bar mill at Maryland plant, Bethlehem Steel Co., showing roughing stands, intermediate roughers, and looping stands. Built for four-strand operation, this mill has a capacity of 12,000 gross tons per month. Speed of rod from last finishing stand in background is about 46 miles per hour





■ Shown above are three boring bars of Nitralloy steel nitrided by Wesley Steel Treating Co., Milwaukee. No straightening was required. This steel is being generally adopted for boring bars because of its great wear resistance and minimum distortion. Largest bar is 8 inches diameter, 14 feet 7 inches long, weight 1940 pounds; next largest, 6 inches diameter, 10 feet 2 inches long, weight 699 pounds; smallest, 4 inches diameter, 6 feet long, weight 167 pounds. The largest is believed to be the longest nitrided in this country. Distortion is minimized by relieving machining stresses at about 1200 degrees Fahr. Photo courtesy Nitralloy Corp., New York

# ...and Steel in Industry Today

**Steel has become probably the most essential ingredient of today's industries. In construction, in the process industries, in textile plants—go where you will, you can hardly find an activity of man which can dispense with steel.**

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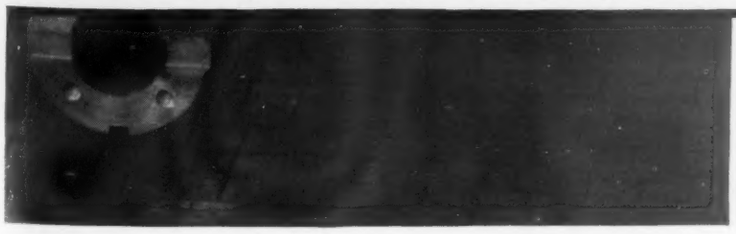
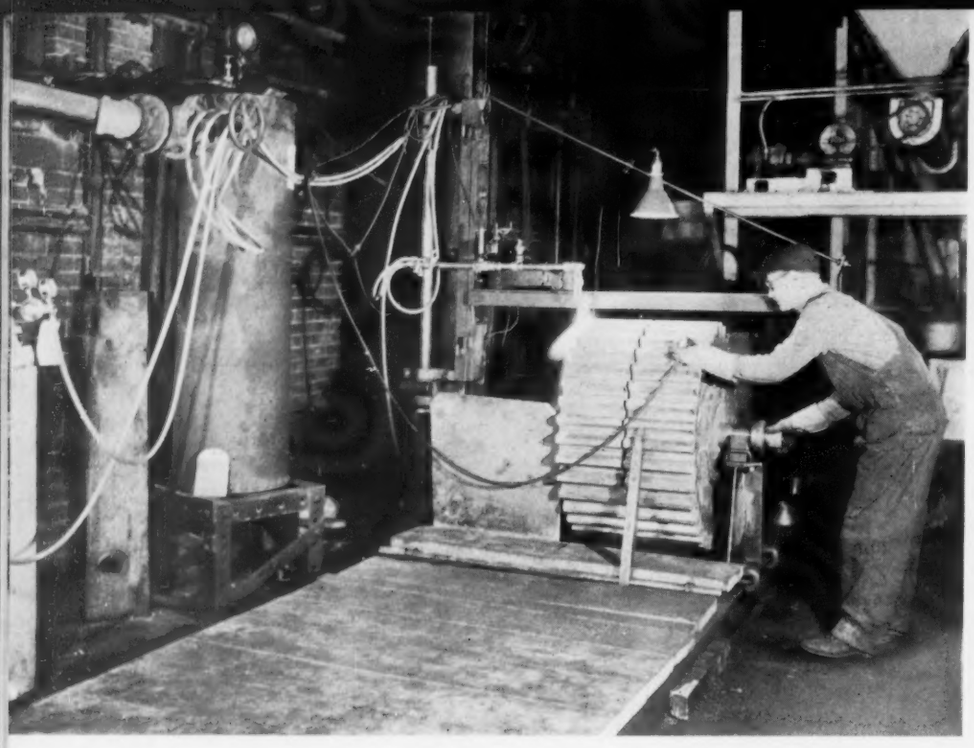
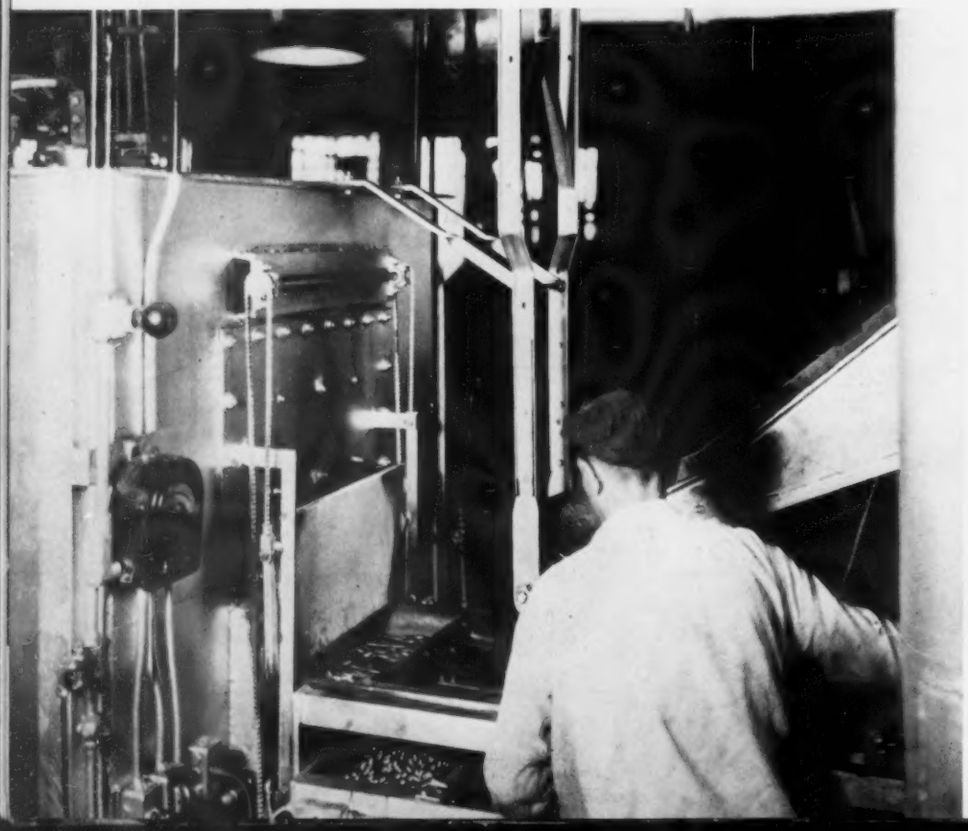




■ Many plants are turning to the oxyacetylene torch as an effective means for surface hardening. The illustration above shows the set-up devised by Wellman Engineering Co., Cleveland, for flame hardening teeth of 0.40 to 0.50 per cent carbon steel gears. Fine streams of water directly behind the flame quench the teeth and harden them to 65 scleroscope. The equipment shown makes use of torches and accessories made by Air Reduction Sales Co., New York

■ The scale-free electric hardening furnace shown below, built by General Electric Co., Schenectady, N. Y., and recently installed by the National Acme Co., Cleveland, has a capacity of 800 pounds per hour, but turns out 1000 pounds. With its use, hardening costs are reduced, hardening is more uniform, water quenched parts have higher brinell, and pickling of parts is eliminated. Production was increased by studying daily records with a Chronolog



■ Because tools and dies often are intricate in character, tool and die-makers are confronted with the problem of obtaining uniform hardness in tool steel sections varying greatly in cross section. The shape shown above, a water hardening steel, is typical of an unbalanced section difficult to harden. Recently, Carpenter Steel Co., Reading, Pa., introduced matched tool steels which simplify selection of types to meet required service and which feature rapid heating, positive quenching, freedom from soft skin, simpler and more certain hardening

# ON . . OFF . . ON . . OFF *without a moving part*

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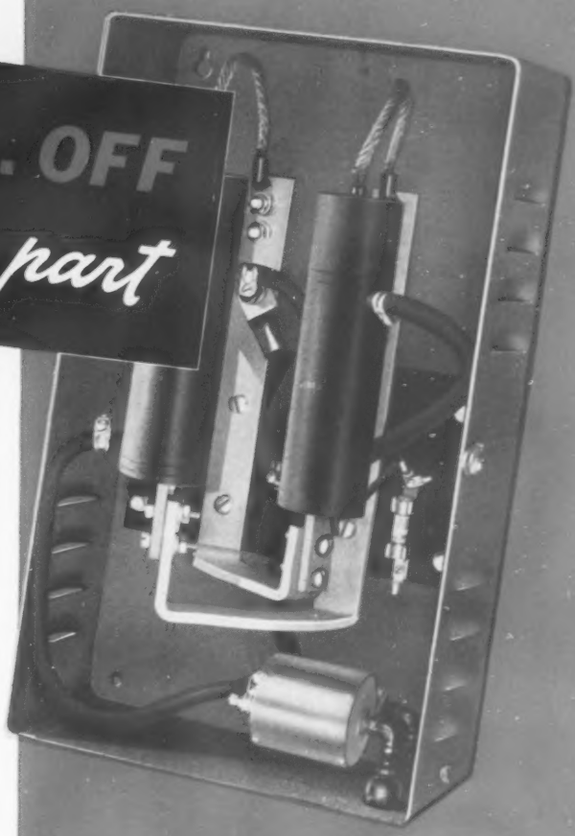

On . . . off . . . on . . . off . . . as fast as 400 times and more per minute, this amazing new switch controls resistance welding current . . . without a single moving part!

Never has this been possible before . . . only through years of engineering research by Westinghouse in the field of resistance welding control is it now possible. WELD-O-TROL now minimizes the high maintenance costs and outage charges connected with resistance welding operations. Because there are no moving parts, there is nothing to wear out or cause production interruptions at frequent intervals.

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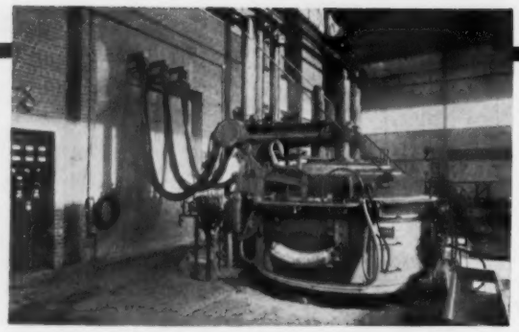

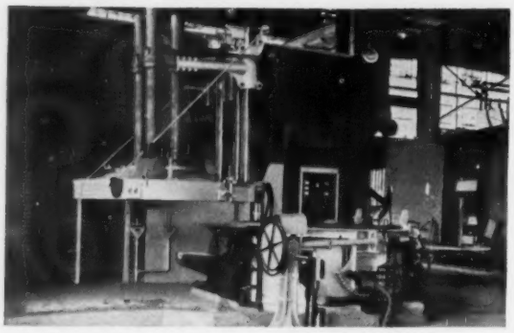

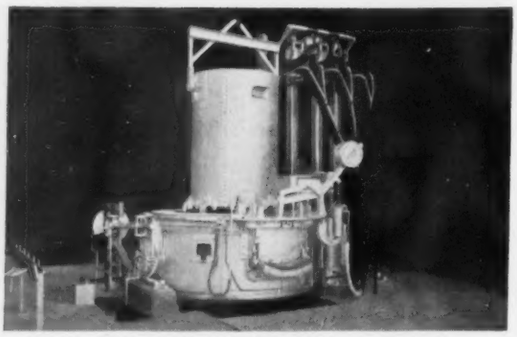

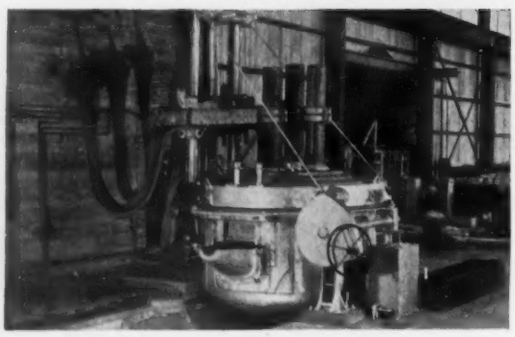

# FOR MODERN ROLLING MILLS • FOR MAKING PLAIN CARBON AND ALLOY STEEL INGOTS

*Moore Rapid*

# *Lectromelt*

*Furnaces*

## TOP CHARGE AND DOOR CHARGE TYPES

LECTROMELT furnaces are extensively used in rolling mills for the production of plain carbon and alloy steel ingots. With the top charge type LECTROMELT furnace there are savings in power, electrodes, refractories and man hours. Furnaces for machine charging and chute charging are also available.

LECTROMELT furnaces are ruggedly built to give long service with low maintenance and with rapidity and economy of operation. LECTROMELT furnaces are available in standard capacities from 25 pounds to 100 tons.

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'LECTROMELT FURNACES OF CANADA, LIMITED
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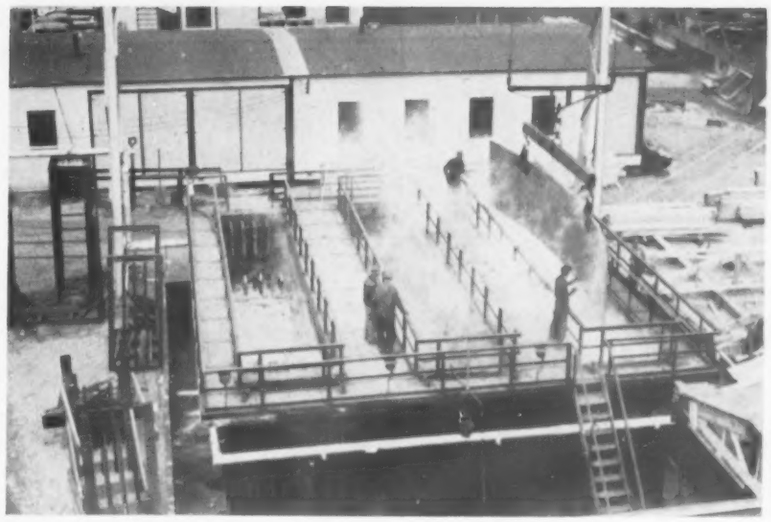
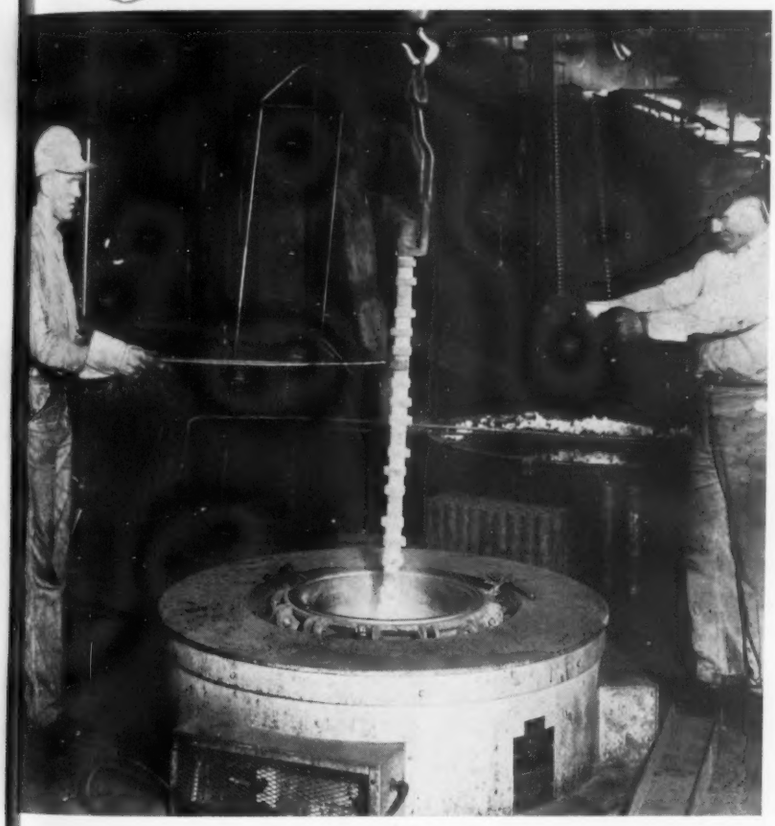
Associate British Company
BIRMINGHAM ELECTRIC FURNACES, LIMITED
Birmingham, England

**PITTSBURGH LECTROMELT FURNACE CORPORATION**
**P. O. BOX 1257 · PITTSBURGH, PA.**

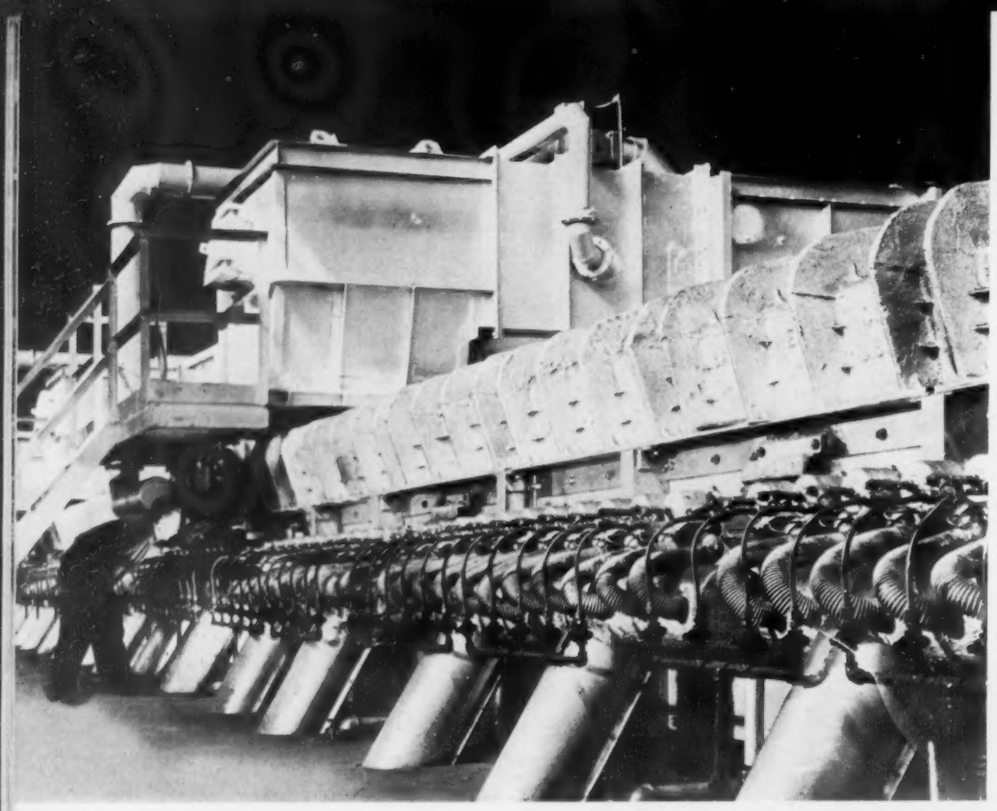
■ Chicago Bridge & Iron Co. is using a special phosphoric acid process at its Greenville, Pa., shops for pickling steel plates for oil storage tanks. The pickling plant (right) is an outdoor installation and consists primarily of three rectangular vats, the first containing mild warm sulphuric acid solution; second, rinse water; and third, hot phosphoric acid solution to which iron phosphate is added. The latter solution deposits a thin coating of iron phosphate which serves as a good paint bond





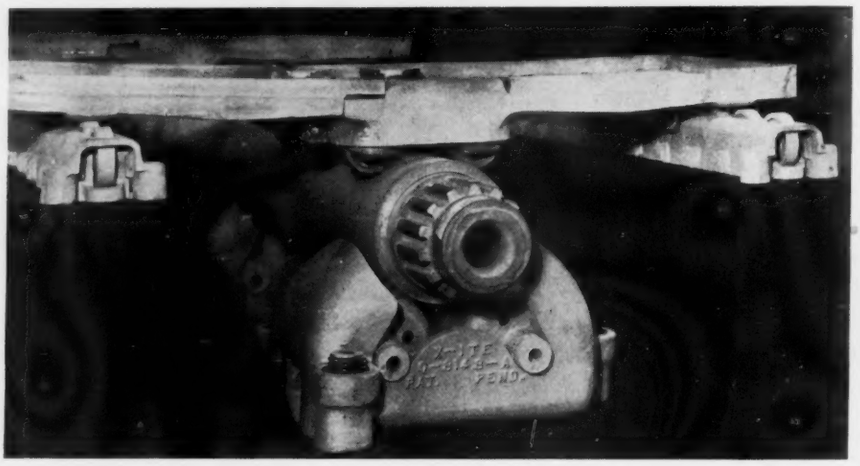
■ To avoid distortion during the carburizing of camshafts for its 4-cycle medium-speed diesel engines, Fairbanks, Morse & Co., Beloit, Wis., performs this operation by placing the shafts in an upright position in a vertical retort electric carburizing furnace built by Hevi Duty Electric Co., Milwaukee. The illustration at the left shows workmen removing one of the camshafts from the furnace after the heating cycle is complete. This type of furnace is finding new applications for heat treating products without distortion

■ High tensile steels are finding expanding applications in transportation equipment in which dead load must be reduced as far as possible to increase pay load. The truck body (below), built by Barry & Bailey Co., Philadelphia, is constructed from the new Dyn-el steel of Alan Wood Steel Co., Conshohocken, Pa., and saves hauling costs on 2040 pounds. Total weight of the body is 2460 pounds; conventional weight would be 4500 pounds. Dyn-el steel contains no alloys, gaining its high strength and corrosion resistance from a patented quenching and tempering process



■ The continuous natural-gas skelp heating furnace, shown at the left, constitutes an important unit in the new butt weld pipe mill of Spang Chalfant & Co. Inc., Etna, Pa. Built by Salem Engineering Co., Salem, O., this furnace operates with temperatures graduated from 1900 degrees Fahr. at the entering end to 2900 degrees at the exit. It is equipped with three recuperators each having 21 chromium steel elements through which combustion air passes and is heated by waste gases. This contributes to close temperature control

■ A recent development of General Alloys Co., Boston, is the Smooth-Screw furnace conveyor (right) for moving trays through a furnace without compression. It is installed in a furnace of a gear manufacturer in Muncie, Ind. Made of heat-resisting alloys, it can be run at any speed, start, stop, back-up, intermittent or continuous operation. It is self-emptying and can be run at any percentage of production, one tray or full load



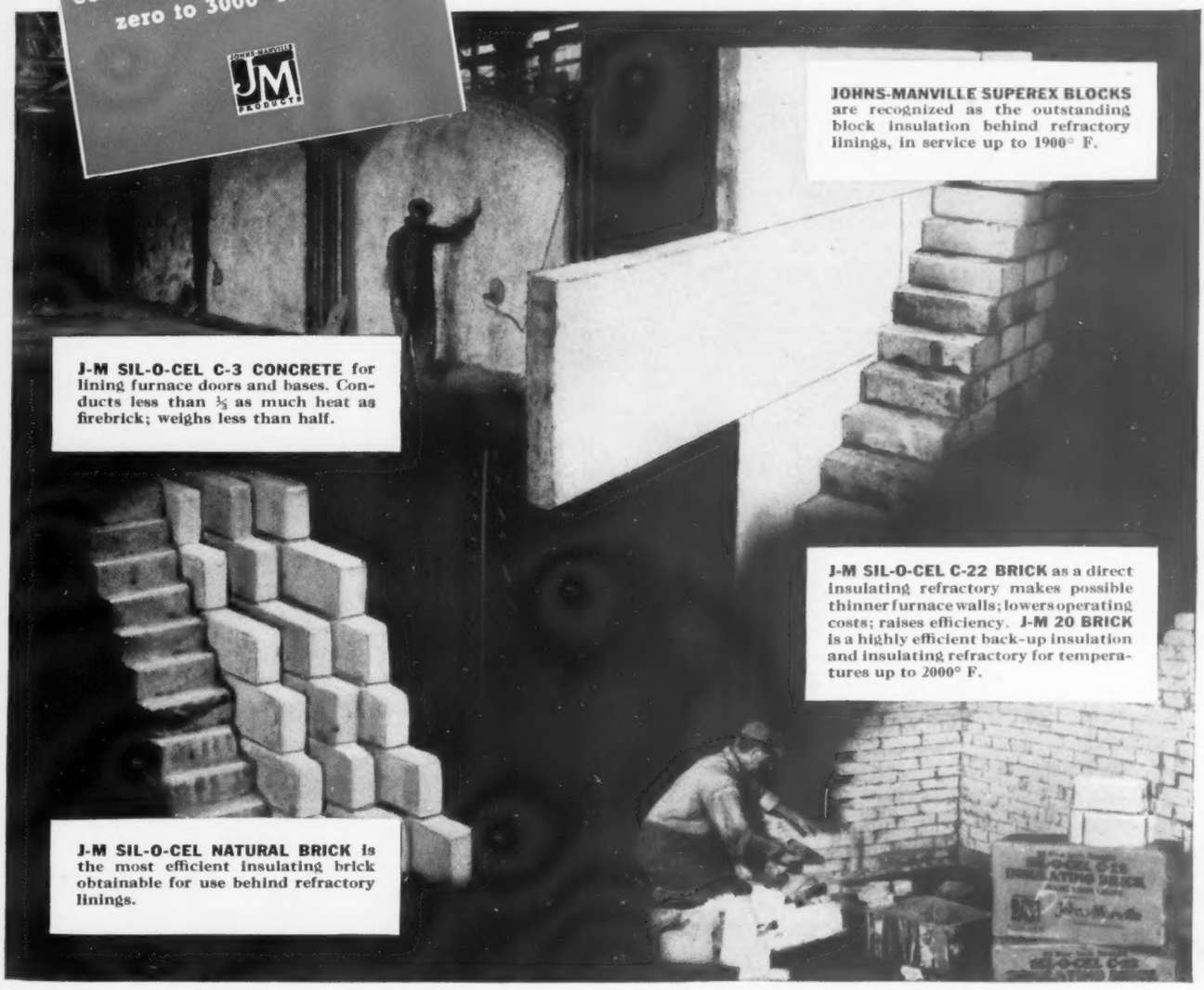
■ "Reflections in a Modern Tap Room" is an appropriate caption for the illustration at the left. Ceiling of this room makes use of Ludlite, the new stainless steel surfaced composite material introduced this past year by Allegheny - Ludlum Steel Corp., Watervliet, N. Y. Light-gage stainless is combined under heat and pressure with a waterproof non-metallic backing. It can be cut and formed on the job, and nailed, screwed or cemented in place. The material affords the beauty, corrosion resistance and durability of standard-gage stainless at lower cost

# Johns-Manville INDUSTRIAL INSULATIONS

For every temperature condition from 400° F. below zero to 3000° F. above.

JM PRODUCTS

# . . . designed to solve YOUR furnace insulating problems!



**JOHNS-MANVILLE SUPEREX BLOCKS** are recognized as the outstanding block insulation behind refractory linings, in service up to 1900° F.

**J-M SIL-O-CEL C-3 CONCRETE** for lining furnace doors and bases. Conducts less than ⅓ as much heat as firebrick; weighs less than half.

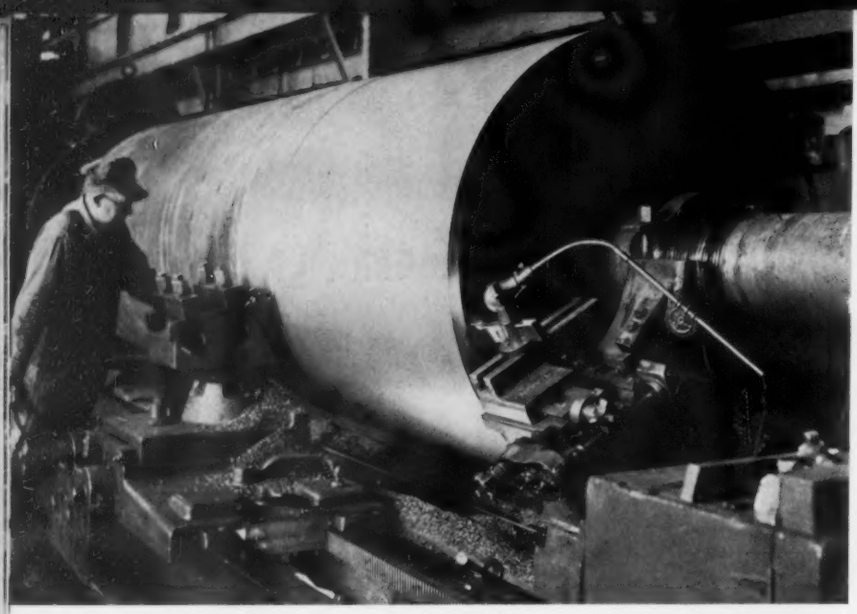
**J-M SIL-O-CEL C-22 BRICK** as a direct insulating refractory makes possible thinner furnace walls; lowers operating costs; raises efficiency. **J-M 20 BRICK** is a highly efficient back-up insulation and insulating refractory for temperatures up to 2000° F.

**J-M SIL-O-CEL NATURAL BRICK** is the most efficient insulating brick obtainable for use behind refractory linings.

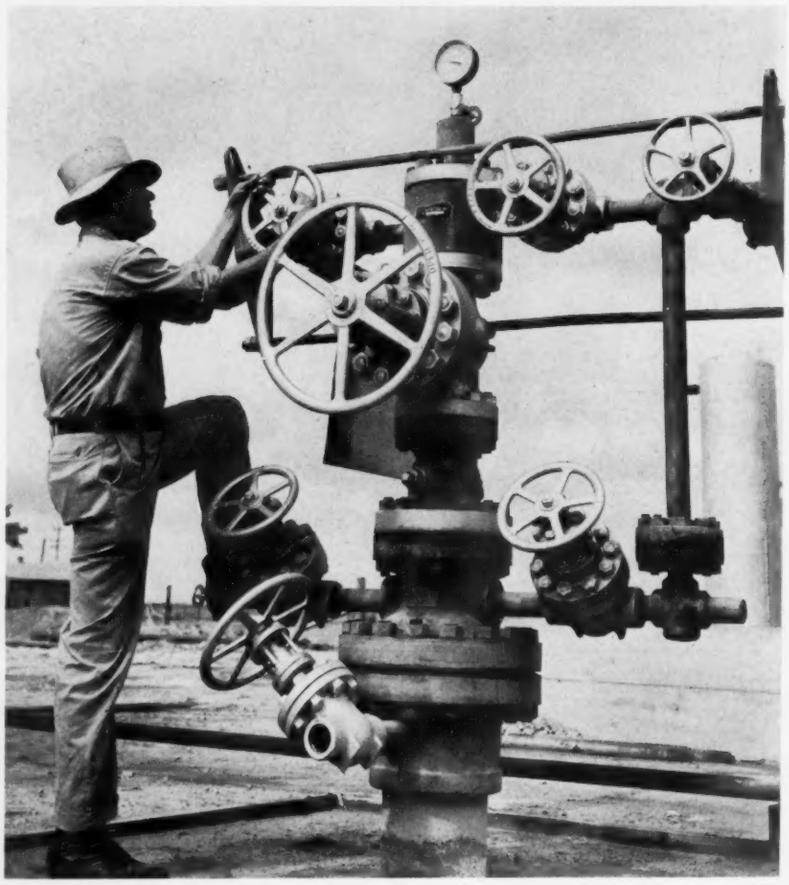
***For detailed information about the complete line of J-M Insulations, visit our exhibit at the National Metal Exposition at Detroit, Booth C-256***

"CUSTOM DESIGNED," these J-M Insulations—to fit the needs of your furnaces. Behind each insulation a research and service record of more than seventy-five years . . . A carefully trained engineering organization, specializing in the science of heat control; in the constant improvement of existing insulations and the development of new ones to meet changing industrial needs.

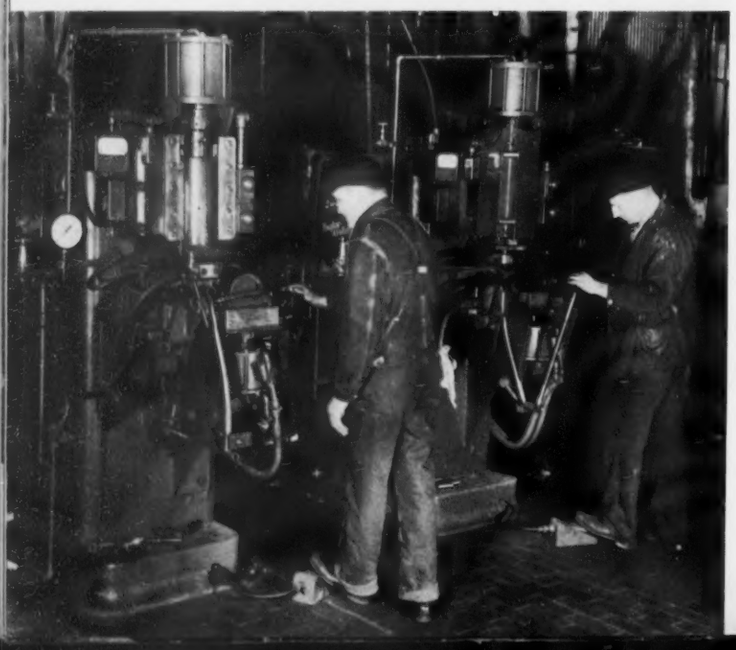
As a result—each J-M material effects maximum efficiency and economy on the insulating job for which it is designed. If you are interested in the profits made by checking heat losses, send for our free engineering brochure, "Insulation of Industrial Furnaces and Ovens." Write to Johns-Manville, 22 E. 40th St., New York City.



■ This 5-foot diameter 18-foot cast iron roll (above) is rough turned, faced, and bored with Haynes Stellite-2400 tools. Ends are bored, and ends and inside shoulder faced while the outside is turned. Two tools are used for rough turning; the first takes a ¼-inch cut, second a 1/8-inch cut. Surface speed is 85 feet per minute and feed is ¼-inch per revolution. These tools cut a distance of over 2½ miles on each roll. Two rolls are turned per tool grind. Photo courtesy Haynes Stellite Co., Kokomo, Ind.



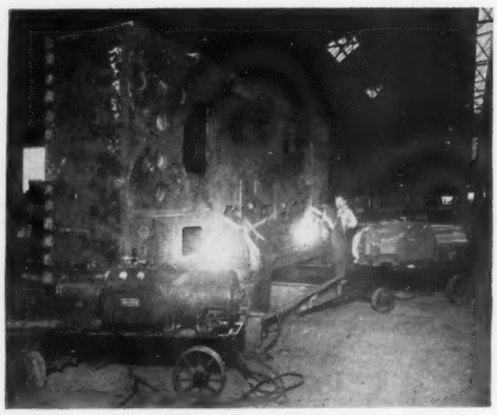
■ Cast manganese-molybdenum steel is finding increasing use as a material for Christmas tree valves and blowout preventer bodies in the oil fields. The fact that it combines relatively low cost with adequate physical properties is principally responsible for its selection for such service. The Christmas tree valves (right) have their bodies cast from this steel. Photo courtesy Climax Molybdenum Co., New York



■ A new resistance welding process applicable to tubing and producing strong joints without external flash was perfected during the past year by Steel & Tubes Inc., Cleveland, subsidiary of Republic Steel Corp. Known as the Hart process, it has advantages in the production of bicycles. Obtaining a license to the process, Cleveland Welding Co., Cleveland, a large bicycle manufacturer, installed the first production line for its use. Two of the automatic press welding machines built by Taylor-Winfield Corp., Warren, O., are shown at the left. Welds are made by bringing the parts together under heavy pressure and applying a high current for a relatively short time

At the NATIONAL METAL EXPOSITION
DETROIT—OCTOBER 17-21
BOOTH
B515

# Learn why WILSON ARC WELDERS are so widely preferred!



On structural steel jobs, on pipe line construction in the oil and gas fields, in manufacturing plants large and small, in welding shops,—in fact wherever arc welding is done you'll find WILSON Arc Welders.

They're favored because they make welding easier and *assure better results at lower cost.* And here's why they can be depended on to do this every time:

1. They provide a range of voltage and current adjustments which *make it possible to establish an arc with exactly the right heating characteristics for the particular welding job at hand.*
2. Once established, they make that arc behave. The basic WILSON electrical design *automatically maintains an exceptional degree of arc stability.*

Be sure to see these features demonstrated at the show, Booth B515. Or, if you're not going, the WILSON Arc Welder Catalog will give you full details. Write for a copy.

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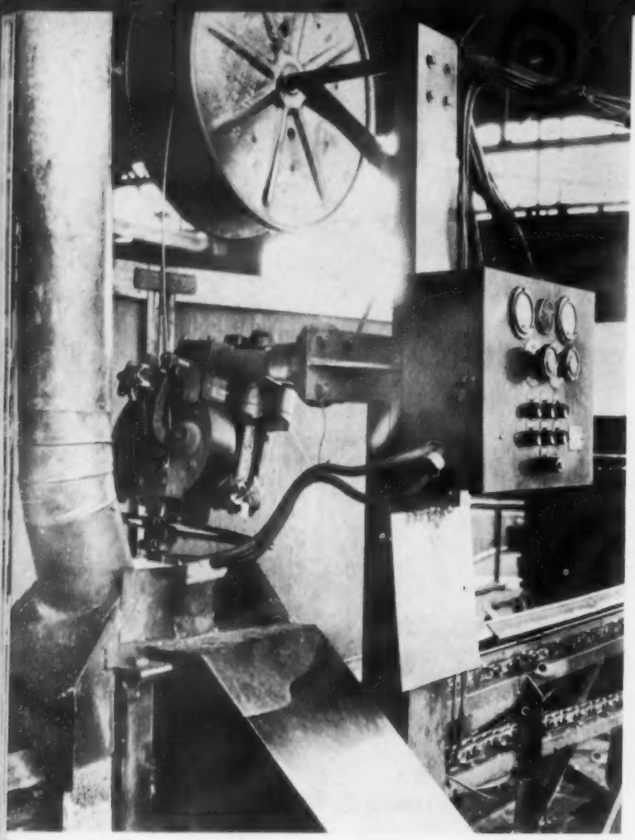
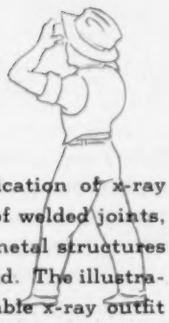
WILSON ARC WELDERS—"The machines that make the arc behave"



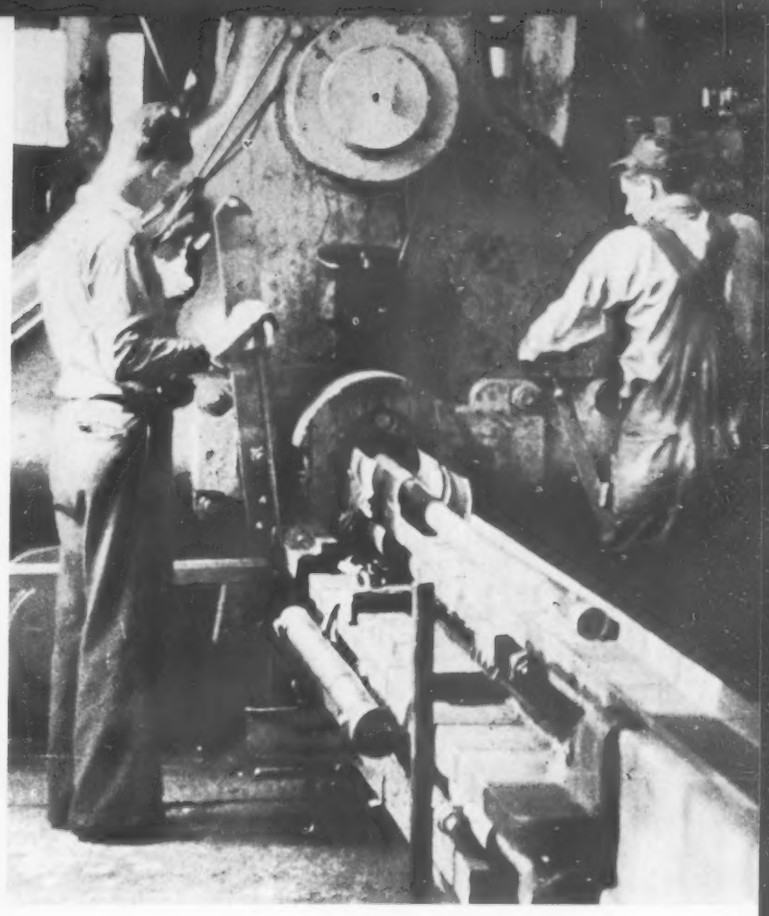
■ Mechanical Handling Systems Inc., Detroit, employs this newly-developed thyratron-controlled automatic arc welding equipment (left) 24 hours a day, 5½ days a week in producing tubes used in fabricating racks for transportation and storage of auto parts. The tubes of rectangular cross section are formed in 8-foot lengths from ⅛-inch flat steel stock, and are carried by a continuous chain conveyor and passed beneath the welding head which continuously feeds high-speed lightly-coated electrode from the overhead reel into the longitudinal butt joints at the proper rate. This equipment, a product of General Electric Co., Schenectady, N. Y., welds more than 6 miles of this tubing each week

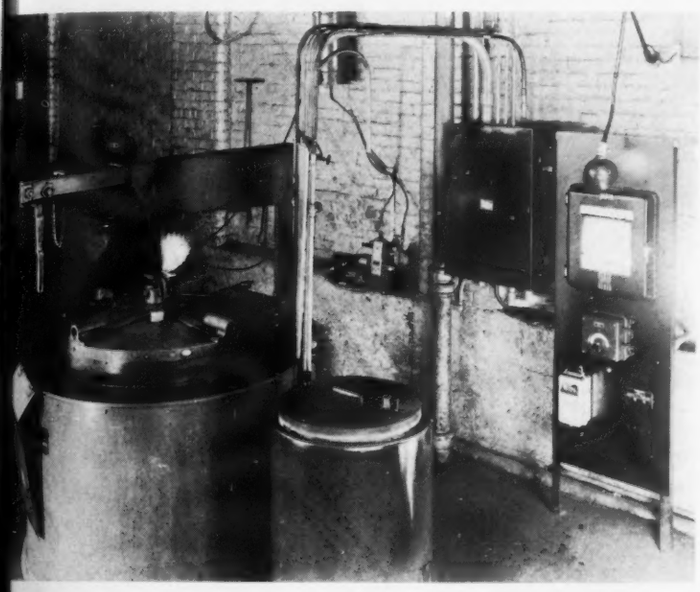


■ Each year sees wider application of x-ray equipment in the inspection of welded joints, castings and highly-stressed metal structures both in the shop and in the field. The illustration at the right shows a portable x-ray outfit in action with the operator at the controls. The apparatus is shown as set up on a recent job in a power house to examine field welded pipe joints. The same machine can be utilized equally well for the inspection of airplane structures and parts in place. St. John X-Ray Service Inc., Long Island City, N. Y., is manufacturer of the equipment

■ Rolled aluminum sheets are annealed in this furnace built by W. S. Rockwell Co., New York. An important feature is an open-mesh wire belt provided with aluminum cleats to prevent the product from marking through contact with the wires. Supplied by the Cambridge Wire Cloth Co., Cambridge, Md., the belt has a duplex selvage giving double strength at high wear points

■ Modern steam turbines impose increasingly severe burdens on condenser tubes. Metallurgical research, therefore, was required to develop new refractory copper alloys which will give satisfactory service under specific conditions. These alloys are carefully cast into billets, cut to length, brought to a red heat and extruded into tubes which are later reduced in size. Illustration (right) shows a tube leaving hydraulic extrusion press in the Rome, N. Y., plant of Revere Copper & Brass Inc. This press, built by Schloemann Engineering Co., Pittsburgh, applies a 1650-ton pressure for the operation

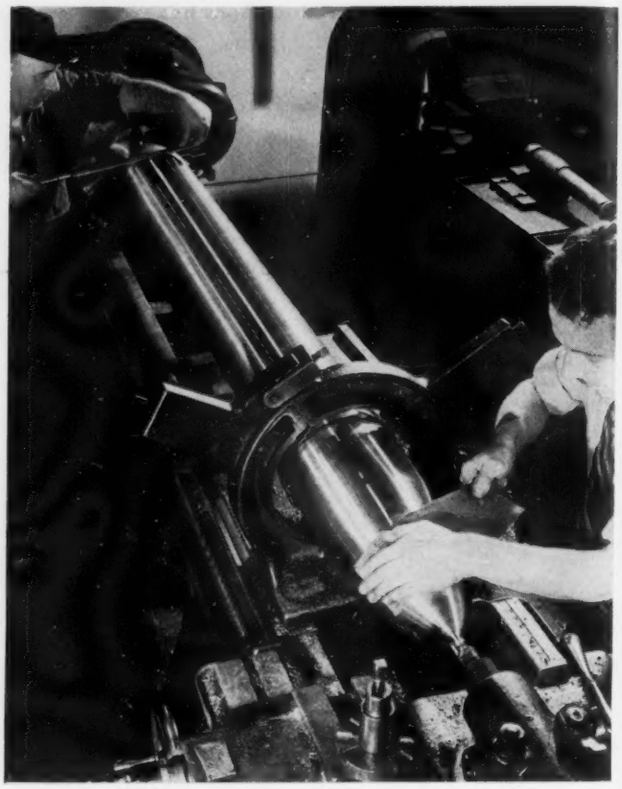




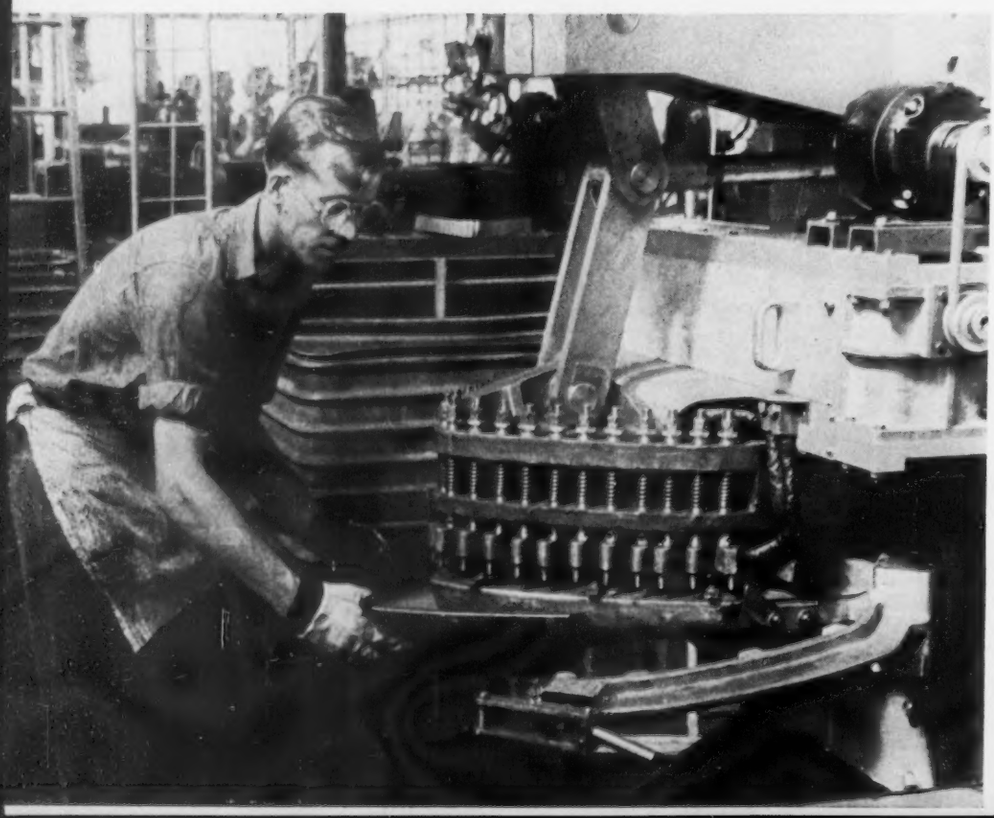
■ Gas carburizing of steel parts is function of the Homocarb vertical retort electric furnace (left), a new development just announced by the Leeds & Northrup Co., Philadelphia. The unit employs the Homo principle of forced convection to provide uniform, rapid and economical results. It is equipped with Micromax control equipment also manufactured by this company

■ The oxyacetylene barrel welding machine (right) can be adjusted to fabricate various sizes of barrels or drums of 18 to 12-gage metal—18-gage barrels, with a 3-foot longitudinal weld, at the rate of 75 to 100 per hour. Actuating rollers line up the unwelded cylinder and pull it forward toward the welding flames. Welding is accomplished by a 10-flame head, supplemented by one insulating or neutralizing flame directly underneath the line of weld. Welding is followed by water spray quench. Photo courtesy the Linde Air Products Co., New York

■ Insulating refractories are finding broader applications, one pronounced step being their successful use in powdered coal fired furnaces. At the left is shown one of two malleable iron annealing ovens installed by James Mfg. Co., Fort Atkinson, Wis., both making use of insulating fire brick supplied by Armstrong Cork Co., Lancaster, Pa. The ovens operate at a temperature of 1650 degrees Fahr. and will load 32 tons. A notable economy in fuel consumption has been achieved



■ Shown at the right is the final finishing operation on the 800-pound torpedo-like "Time Capsule" which Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will deposit in the earth at New York world's fair in 1939 for recovery 5000 years hence. Of interest is the fact that the capsule, which is 7½ feet long and 8 inches diameter, is made from Cupaloy, the company's new copper-chromium-silver heat-treatable alloy. This alloy culminated a 5-year research to make copper as hard as steel. It holds interesting possibilities for many industrial applications



■ Welding of 22 points in a radiator hood stamping in less than 3 seconds is accomplished with this new Ultra-Speed resistance welder (left) in the DeSoto plant of the Chrysler Corp., Detroit. The unit, built by the Federal Machine & Welder Co., Warren, O., maintains a production of from 275 to 300 assemblies per hour with one operator. The 22 points are individually spring loaded and when under pressure the operator starts the motor drive by push button. Current is carried to each point in sequence by a cam and roller device

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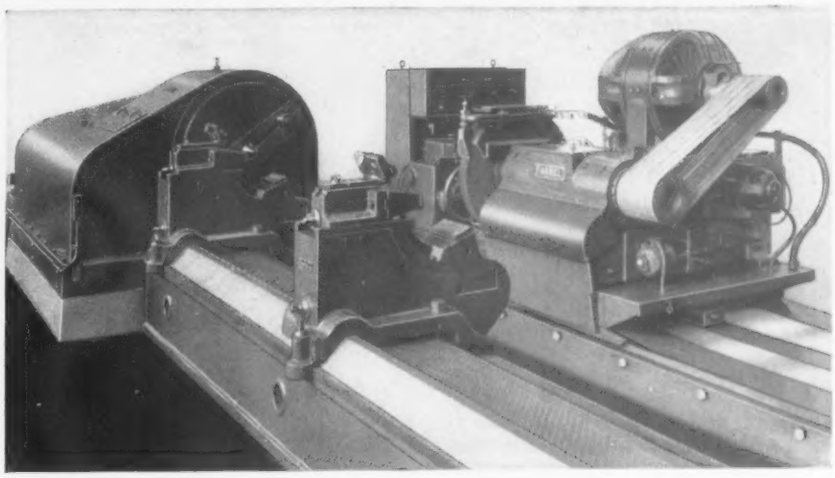
# EQUIPMENT for the STEEL MILL

## PRECISION ROLL GRINDING AT LESS COST

Farrel Heavy Duty Roll Grinders are designed for better, faster and cheaper grinding. Equally capable of heavy roughing or fine finishing on rolls of any material. Grind a perfect surface free from marks of any kind, with straight, concave or convex contours of exact symmetry and accuracy. They reduce the time required for finishing, increase the output of finished rolls and lengthen the life of the rolls themselves.



Farrel Heavy Duty Roll Grinders are built in six standard sizes to grind rolls up to maximum diameters of 24", 28", 36", 44", 50" and 60", and in any length required. The machine illustrated above is 60" x 22'0".

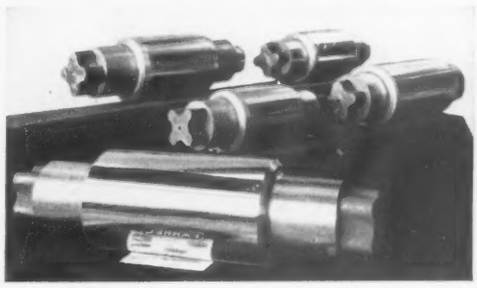
## SMOOTH, QUIET EFFICIENT GEAR DRIVES

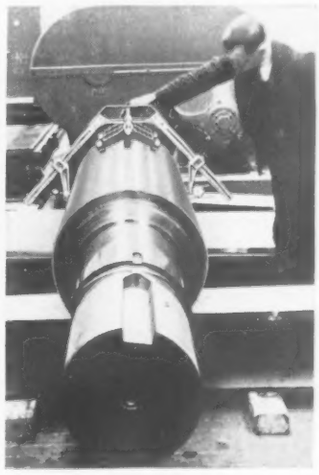
Farrel-Sykes Rolling Mill Reduction Units are designed to withstand the stresses, shocks and wear imposed by the heavy loads and high speeds encountered in the modern rolling mill.

Built with a high degree of precision, they operate smoothly, quietly and efficiently under all conditions of service. Single, double or multiple reduction units for high or low speeds and any power.

## THE GEAR WITH A BACKBONE

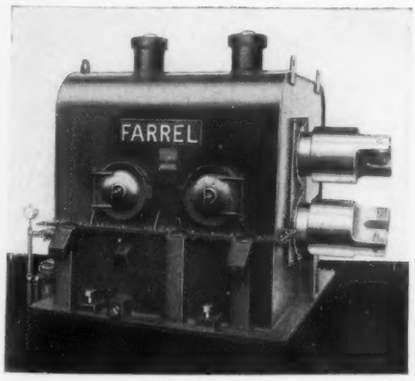
Farrel-Sykes Gears have the "backbone" for heavy duty service. The continuous herringbone teeth give them extra strength and load-carrying capacity, and the accuracy of tooth generation by the famous Sykes process makes them smooth-running, efficient and economical.



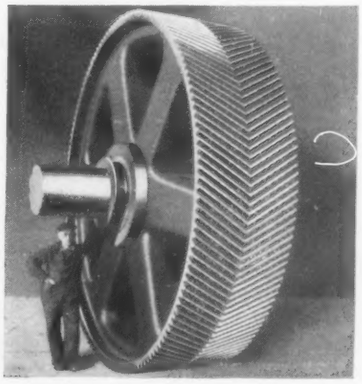


Above—Farrel Ni-Hard Rolls combine hardness of 85 to 90 scleroscope with high strength and flawless surface. Ideal for high finish sheets, they produce a higher quality finish, have longer life and cut ton-cost of production.

Right—The Farrel Indicating Caliper provides exact check of roll accuracy. Made in five sizes to measure rolls from 4" to 50" diameter.




Double Reduction Unit with integral 20" Pinion Stand for driving 20½"_& 53" x 48" four-high temper pass mill.



Farrel-Sykes Continuous Tooth Herringbone Gear for rolling mill drive, 5,000 H.P., weight 51,700 lbs., 145" diameter, 1 D.P., 40" face.

Farrel Gearflex Couplings provide complete flexibility and protect connected machines. Complete range of sizes from 2" to 20" shafts.

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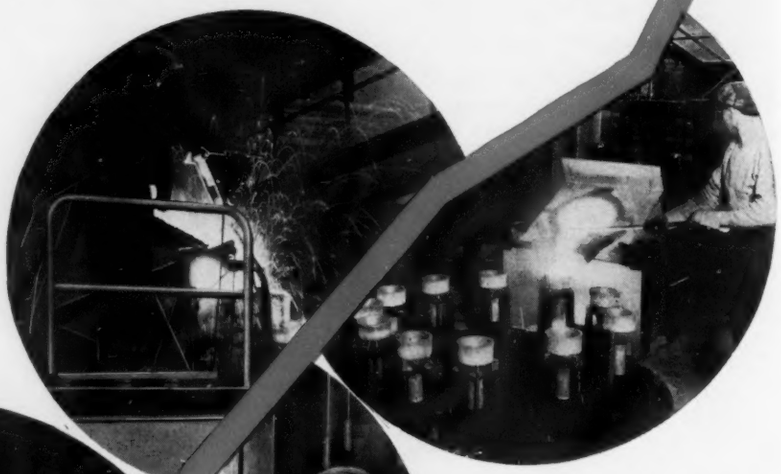
# NOW 100,000 KW →

## IN AJAX-NORTHRUP FURNACES AND HEATERS

The curve on this page shows the growth in KW of Ajax-Northrup Furnaces installed all over the world during the past ten years.



**USED FOR MELTING . . . . . SURFACE HARDENING . . . . . LOCALIZED HEATING FOR FORGING . . . CONTINUOUS HEAT TREATING . . . BRAZING**

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**ONE OUNCE TO EIGHT TONS**

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**AJAX MELTING FURNACES PROVIDE:** Speed, uniformity, low metal losses, quick changes from one alloy to another—and controlled stirring during the melt.

**AJAX HEATING FURNACES PROVIDE:** Speed, close temperature control, absence of scale in forging, zone hardening and a score of applications that save time, materials and rejects.

Ajax Furnaces produce better results at a lower total manufacturing cost per piece or per pound. Users in most cases report that the cost of current is negligible in view of the results obtained.

**SEE THE AJAX EXHIBIT BOOTH No. B-116, DETROIT, OCT. 17-21**

**ASSOCIATE COMPANIES**

**The Ajax Metal Co.**
Non-ferrous Ingot Metal for foundry use.

**Ajax Electric Furnace Corporation**
Ajax-Wyatt Induction Furnaces for melting.

**Ajax Electric Co., Inc.**
Ajax-Hultgren Salt Bath Furnace and Resistance Type Electric Furnaces for all heat treating operations.

# AJAX

**ELECTROTHERMIC CORPORATION**

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**AJAX PARK**
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1-A

# TECHNICAL PROGRAM

**Features Are 13 Sessions with 40 Papers, Two Educational Courses, Campbell Memorial Lecture and Symposium on Hardenability**

**Monday, Oct. 17**

10:00 A. M.—Statler Hotel

"Softening Rate of a Steel when Tempered from Different Initial Structures," by E. H. Engel, Carnegie-Illinois Steel Corp., Vandergrift, Pa.

"Selective Hardening with the Oxyacetylene Flame," by R. L. Rolf, Lakeside Steel Improvement Co., Cleveland.

"Reactions to Annealing Above the Eutectoid Temperature of Quenched Hyper-eutectoid Steels," by C. R. Austin and M. C. Fetzer, Pennsylvania State college, State College, Pa.

10:00 A. M.—Statler Hotel

"Relation Between Rockwell "C" and Diamond Pyramid Hardness Scales," by Howard Scott and T. H. Gray, research laboratories, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"Absolute Hardness," by E. G. Mahin and G. J. Foss Jr., University of Notre Dame, Notre Dame, Ind.

"Effects of Fiber on Notch Toughness of Mild Steel as Influenced by Cooling Rate," by O. W. Ellis, Ontario Research Foundation, Toronto, Ont., and J. E. McDonell, Queen's university, Kingston, Ont.

"A New Method for Rapid Determination of Carbon in Samples of Plain Carbon Open-Hearth Steel," by B. A. Rogers, Karl Wentzel and J. P. Riott, bureau of mines, Pittsburgh.

2:00 P. M.—Convention Hall

"Effects of Special Alloy Additions to Stainless Steels," by Russell Franks, Union Carbide & Carbon Research Laboratories Inc., Niagara Falls, N. Y.

"Stress-Corrosion Cracking in Austenitic Stainless Steels," by S. L. Hoyt and M. A. Scheil, department of metallurgical research, A. O. Smith Corp., Milwaukee.

"Some Observations on the Passivity of Stainless Steels," by J. N. Ostrofsky, Rustless Iron & Steel Corp., Baltimore.

4:30 P. M.—Convention Hall

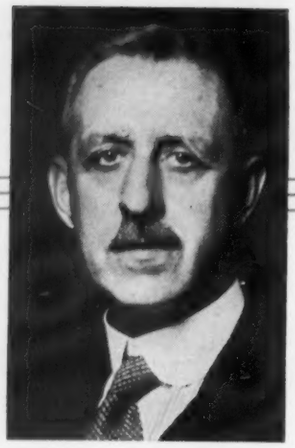
*Educational Lecture*

"Physics of Cutting," lecture No. 1, by Hans Ernst, Cincinnati Milling Machine Co., Cincinnati.

8:00 P. M.—Convention Hall

*Educational Lecture*

"Pyrometry," lecture No. 1, by R. B. Sosman, research laboratories, United States Steel Corp., Kearny, N. J.



**George B. Waterhouse**

President, American Society for Metals. He is professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

**Tuesday, Oct. 18**

10:00 A. M.—Statler Hotel

"Influence of Chromium, Silicon and Aluminum on Oxidation Resistance of Intermediate Alloy Steels," by A. E. White and C. L. Clark, University of Michigan, Ann Arbor, Mich., and C. H. McCollam, Timken Roller Bearing Co., Canton, O.

"Influence of Aluminum on Cast Corrosion-Resisting Steel," by J. A. Duma, Norfolk navy yard, Portsmouth, Va.

"Development in Molybdenum High Speed Cutting Steels," by W. R. Breeler, Allegheny-Ludlum Steel Corp., Dunkirk, N. Y.

10:00 A. M.—Statler Hotel

"Some Properties of Oxygen-Free High Conductivity Copper (OFHC)," by C. G. Goetzel, Hardy Metallurgical Co., New York.

"A New 70/30 Nickel-Copper Alloy Subject to Precipitation Hardening," by Erich Fetz, Wilbur B. Driver Co., Newark, N. J.

"Effects of Substantial Additions of Aluminum, Cobalt, Titanium and Columbium on the Properties of 80 Ni.-20 Cr. Alloys," by A. L. Sanford and O. E. Harder, Battelle Memorial institute, Columbus, O.

2:00 P. M.—Convention Hall

"Production of Flakes by Treating Molten Steel with Hydrogen and the Time of Cooling Necessary to Prevent Their Formation," by R. E. Cramer and E. C. Bast, University of Illinois, Urbana, Ill.

"Effect of Carbon Content on Oxidation of Steel," by C. A. Siebert, University of Michigan, Ann Arbor, Mich.

"Some Effects of Deoxidizers in Low Carbon—1.5 Per Cent Chromium Steel," by Walter Crafts and J. L. Lamont, Union Carbide & Carbon Research Laboratories Inc., Niagara Falls, N. Y.

4:30 P. M.—Convention Hall

*Educational Lecture*

"Machinability of Ingot Iron, Wrought Iron, S.A.E. Steels and Stainless Steels," lecture No. 2, by H. B. Knowlton, International Harvester Co., Chicago.

8:00 P. M.—Convention Hall

"Pyrometry," lecture No. 2, by R. B. Sosman, research laboratories, United States Steel Corp., Kearny, N. J.

**Wednesday, Oct. 19**

9:30 A. M.—Statler Hotel

*Annual Meeting*

Reports of officers.

Election of officers.

Edward De Mille Campbell Memorial lecture, by A. L. Boegehold, research laboratories division, General Motors Corp., Detroit.

2:00 P. M.—Convention Hall

"Graphitizing Rate and Nodule Number," by H. A. Schwartz and M. K. Barnett, National Malleable & Steel Castings Co., Cleveland.

"Effect of Type of Cold Deformation on the Recrystallization Properties of Armco Iron," by H. F. Kaiser and H. F. Taylor, division of physical metallurgy, naval research laboratory, Washington.

"Constitution Diagrams for Iron-Carbon-Molybdenum Alloys," by J. R. Blanchard, R. M. Parke and A. J. Herzig, Climax Molybdenum Co., Detroit.

4:30 P. M.—Convention Hall

*Educational Lecture*

"Some Factors Affecting Machinability of Cast Steel, Cast Iron, and Malleable Iron," lecture No. 3, by J. W. Bolton, Lunkenheimer Co., Cincinnati.

8:00 P. M.—Convention Hall

*Educational Lecture*

"Pyrometry," lecture No. 3, by R. B. Sosman, research laboratories, United States Steel Corp., Kearny, N. J.

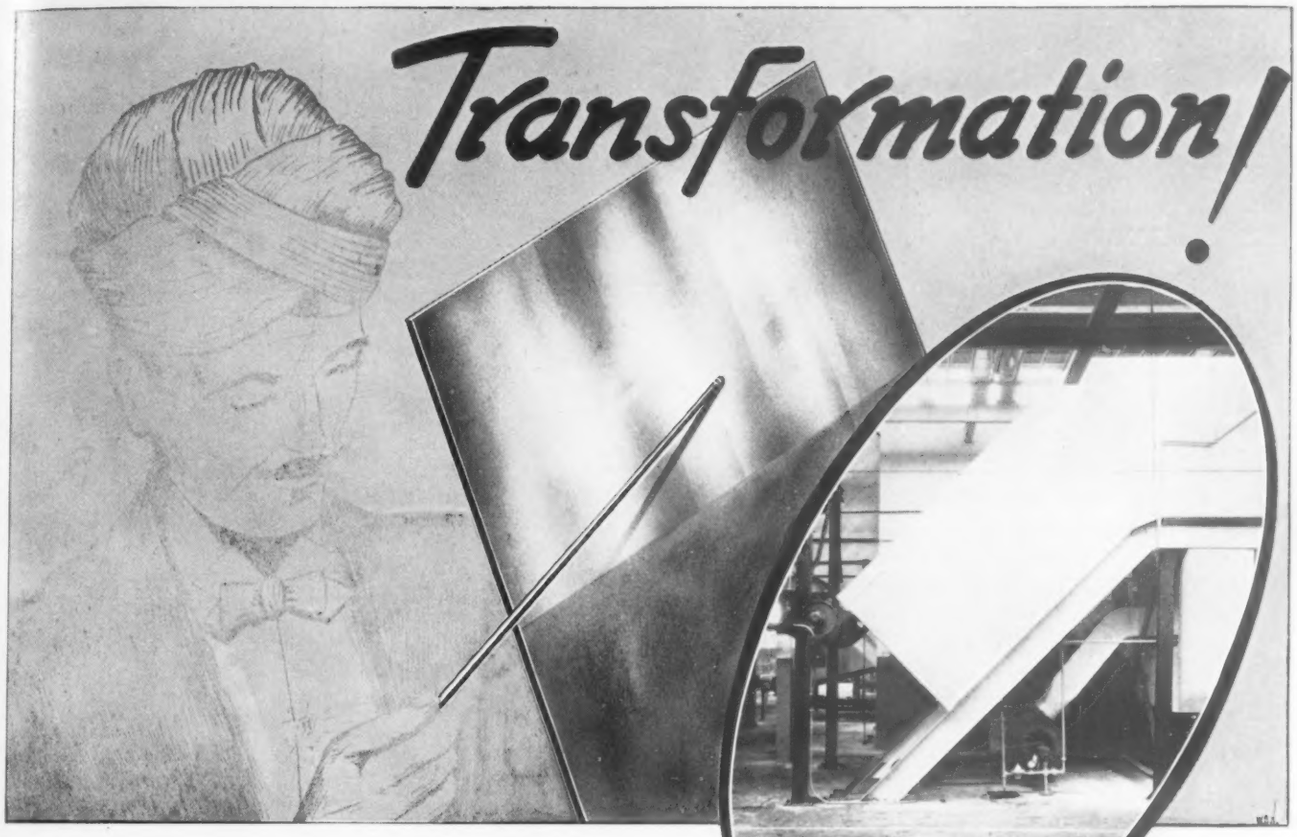
**Thursday, Oct. 20**

10:00 A. M.—Statler Hotel

"White Layer Structure in Erosion of Machine Gun Barrels," by W. H. Snair, American Can Co., and

**William P. Woodside**

Vice president, and nominee for president, American Society for Metals. He is vice president, Climax Molybdenum Co., Detroit

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**Alfred L. Boegehold**

1938 Campbell Memorial lecturer, American Society for Metals. He is head of metallurgical department, research laboratories division, General Motors Corp., Detroit

W. P. Wood, University of Michigan, Ann Arbor, Mich.

"Influence of Microstructure Upon the Process of Diffusion in Solid Metals," by F. N. Rhines and Cyril Wells, Carnegie Institute of Technology, Pittsburgh.

"Study of Carbide Solution in Hypoeutectoid Plain Carbon and Low Alloy Commercial Steels," by R. H. Lauderdale and O. E. Harder, Battelle Memorial institute, Columbus, O.

10:00 A. M.—Statler Hotel

"Possible Uses of Radioactive Substances in Testing of Metals," by Herman F. Kaiser, division of physical metallurgy, naval research laboratories, Washington.

"Color Carbon and Aging," by Carl L. Shapiro, consulting engineer, Syracuse, N. Y.

"Hardness Gradients in Tempered Steel Cylinders," by C. A. Rowe and R. A. Ragatz, University of Wisconsin, Madison, Wis.

2:00 P. M.—Convention Hall

*Symposium on Hardenability of Medium and Low Alloy Steels*

"Physics of Hardenability—Mechanism and Rate of the Decomposition of Austenite," by R. F. Mehl, Carnegie Institute of Technology, Pittsburgh.

"Hardenability, Its Relation to Quenching and Some Quantitative Data," by M. A. Grossman, M. Asimow and S. F. Urban, Carnegie-Illinois Steel Corp., Chicago.

"Effect of Silicon and Aluminum Additions on Hardenability of Commercial Steels," by M. J. R. Morris and H. W. McQuaid, Republic Steel Corp., Cleveland.

4:30 P. M.—Convention Hall

*Educational Lecture*

"Machinability of Tool Steels," lecture No. 4, by A. H. d'Arcambal and W. E. Bancroft, Pratt & Whitney Co., Hartford, Conn.

7:00 P. M.—Statler Hotel

Annual banquet. Speaker: B. F. Fairless, president, United States Steel Corp., Pittsburgh.

**Friday, Oct. 21**

10:00 A. M.—Statler Hotel

*Symposium on Hardenability of Medium and Low Alloy Steels*

"Hardenability Tests," by W. E. Jominy, General Motors Corp., Detroit.

"Hardenability of Low Chromium Steels," by Walter Crafts and J. L. Lamont, Union Carbide & Carbon Research Laboratories Inc., Niagara Falls, N. Y.

"Transverse Hardness Tests of Heat Treated Steels," by G. T. Williams, Cleveland Tractor Co., Cleveland.

10:00 A. M.—Statler Hotel

"A Method for Preparation of Metallographic Specimens," by G. A. Ellinger and J. S. Acken, national bureau of standards, Washington.

"Automatic Polishing of Metallurgical Specimens Using Cast Iron and Lead Laps," by T. C. Jarrett, American Optical Co., Southbridge, Mass.

"A Metallographic Approach to the Study of the Sensitivity of Steel to Cold Work," by H. K. Work and S. L. Case, Jones & Laughlin Steel Corp., Pittsburgh.

2:00 P. M.—Convention Hall

*Symposium on Hardenability of Medium and Low Alloy Steels*

"Hardenability and Its Designation, the Hardenability Line," by B. R. Queneau and W. H. Mayo, Carnegie-Illinois Steel Corp., Pittsburgh.

"Hardenability of Plain Carbon Steels," by J. L. Burns, Republic Steel Corp., Chicago, and G. C. Riegel, Caterpillar Tractor Co., Peoria, Ill.

"Hardenability in Light Sections," by G. V. Luerssen, Carpenter Steel Co., Reading, Pa.

4:30 P. M.—Convention Hall

*Educational Lecture*

"Machining Nonferrous Materials (Cast and Wrought)," lecture No. 5, by H. P. Croft, Chase Brass & Copper Co., Cleveland.

**William H. Eisenman**

Secretary, American Society for Metals, Cleveland. He is also general manager of the National Metal Exposition

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# TECHNICAL PROGRAM

**Monday, Oct. 17**

9:30 A. M.—Book-Cadillac Hotel

Address by Richard W. Reading, mayor of Detroit.

Presentation of Samuel Wylie Miller and Lincoln medals.

*Welding in Construction Work*

"Oxyacetylene Welding of Carbon Molybdenum Steel Pipe," by A. N. Kugler, applied engineering department, Air Reduction Sales Co., New York.

"Single-Pass Electric Welding of Unfired Pressure Vessels," by R. M. Wallace, assistant superintendent, Griscom Russell Co., Massillon, O.

"Welding Structures," by Albert S. Low, vice president, Austin Co., Cleveland.

2:00 P. M.—Book-Cadillac Hotel

*Production Welding Small Machine Parts*

"Welding, Cutting and Machine Design of Small Subassemblies," by Edward J. De Witt, vice president, Wallace Supplies Mfg. Co., Chicago.

"Welding as Applied to Fabrication of Industrial Stokers," by F. R. Mason, Riley Stoker Corp., Detroit.

"Methods for Manufacture of Precision Assemblies by Resistance Welding," by F. D. Rogers, International Business Machines Corp., Endicott, N. Y.

"Arc Welding as Influenced by Shop Preparation, Tools, Jigs and Fixtures," by M. S. Evans, American Car & Foundry Co., Berwick, Pa.

2:00 P. M.—Book-Cadillac Hotel

*Industrial Research*

"Physical and Chemical Properties of the Nickel-Iron Alloys Formed in Welding Nickel-Clad Steel," by W. G. Theisinger, Lukens Steel Co., Coatesville, Pa., and F. G. Flocke, International Nickel Co., New York.

"Weldability of Medium Carbon Steel," by R. W. Emerson, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"Effect of Current, Pressure and Time on Shear Strength and Structure of Spot Welds in the Aluminum Alloys," by G. O. Hoglund and G. S. Bernard Jr., Aluminum Co. of America, New Kensington, Pa.

"An Investigation of Arc and Gas Welded Joints in Aluminum and Aluminum Alloys," by Lieut. Commander R. K. Wells, United States navy, and A. G. Bissell, bureau of construction and repair, navy department, Washington.

**Philip G. Lang Jr.**

President, American Welding Society. He is engineer of bridges, Baltimore & Ohio railroad, Baltimore

**Tuesday, Oct. 18**

9:30 A. M.—Book-Cadillac Hotel

*Joint session with American Society of Mechanical Engineers*

"Welding of Ammonia Containers," by E. H. Behling, Vilter Mfg. Co., Milwaukee.

"Brazing Tubes in High-Pressure Boilers and Silver Alloys," by A. W. Weir, New York Central railroad, and H. M. Webber, General Electric Co., Schenectady, N. Y.

"Welding Bronze and Nonferrous Alloy Piping," by H. D. Lanterman, Carbide & Carbon Chemicals Corp., New York.

"Welded Joints in Carbon Molybdenum Piping," by R. W. Clark, General Electric Co., Schenectady, N. Y.

9:30 A. M.—Book-Cadillac Hotel

*Fundamental Research*

"A Quick Shop Test for Quality of Weld and Its Correlation with Standard Tests," by W. J. Conley, University of Rochester, Rochester, N. Y.

"Effect of Rigid Beam-Column Connections on Column Stresses," by

(*Please turn to Page* 196)

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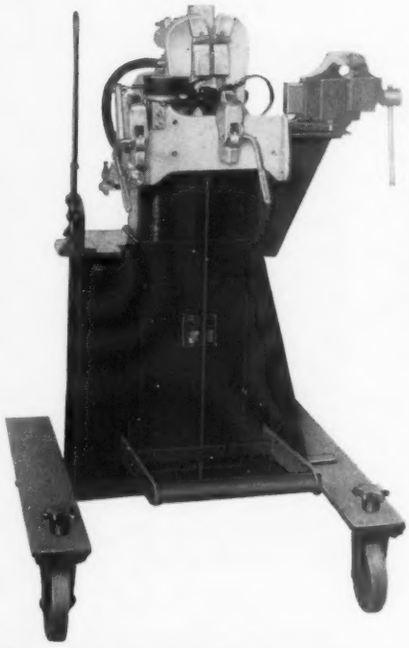

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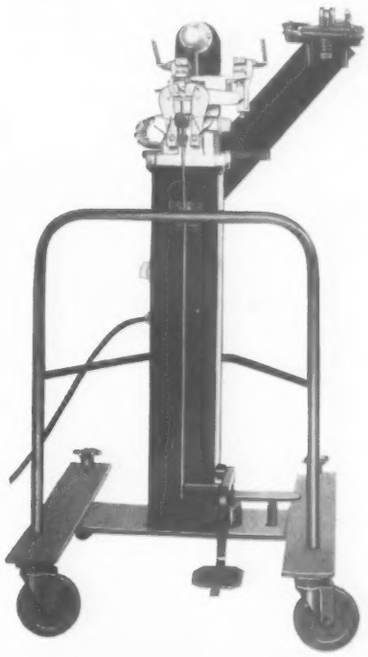

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# TECHNICAL PROGRAM

**Monday, Oct. 17**

10:00 A. M.—Book-Cadillac Hotel

**Institute of Metals Division**

*Diffusion and Recrystallization in Copper and Brass*

"Rates of Diffusion of Copper and Zinc in Alpha Brass," by Ernest O. Kirkendall, instructor, Wayne university, Detroit, and Lars Thomassen and Clair Upthegrove, professors, University of Michigan, Ann Arbor, Mich.

"Plastic Deformation and Subsequent Recrystallization of Single Crystals of Alpha Brass," by M. R. Pickus, department of metallurgy, and C. H. Mathewson, professor of metallurgy, Yale university, New Haven, Conn.

"Development of Abnormally Large Grain Sizes in Rolled and Annealed Copper Sheet," by Maurice Cook, assistant research manager, and C. Macquarie, research metallurgist, I. C. I. Metals Ltd.

10:00 A. M.—Book-Cadillac Hotel

**Iron and Steel Division**

*Physical Chemistry of Steelmaking*

"Reduction of Iron Ores Under Pressure," by Michael Tenenbaum, department of metallurgy, and T. L. Joseph, professor of metallurgy, University of Minnesota, Minneapolis.

"Solubility and Diffusion of Oxygen in Solid Iron," by Arthur B. Wilder, assistant professor of metallurgical engineering, University of Illinois, Urbana, Ill.

"Induction Furnaces for Rotating Liquid Crucibles," by E. P. Barrett, metallurgist, W. F. Holbrook, assistant chemist, and C. E. Wood, acting supervising engineer, bureau of mines, Washington.

**James T. MacKenzie**

Chairman, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers. He is metallurgist and chief chemist, American Cast Iron Pipe Co., Birmingham, Ala.

12:15 P. M.—Book-Cadillac Hotel

Luncheon of Institute of Metals division executive committee.

2:00 P. M.—Book-Cadillac Hotel

**Institute of Metals Division**

*Physical Metallurgy*

"Superlattices: Effect of Silver on Gold-Copper Superlattice, Au. Cu.," by Ralph Hultgren, assistant professor of metallurgy, Harvard university, Cambridge, Mass., and Lester Tarnopol, assistant professor of metallurgy, University of Kentucky, Lexington, Ky.

"Plastic Flow of Metals," by C. W. MacGregor, associate professor in mechanical engineering, Massachusetts Institute of Technology, Cambridge, Mass.

"Electron Diffraction Effects from Polished Zinc Surfaces," by M. L. Fuller, investigator, research division, New Jersey Zinc Co., Palmerton, Pa.

2:00 P. M.—Book-Cadillac Hotel

**Iron and Steel Division**

*Steelmaking Practice*

"Effect of Hot Metal Analysis and Casting Temperature on Quality of Open-Hearth Steel," by L. H. Nelson, assistant open hearth superintendent, Republic Steel Corp., Buffalo.

"Solidification of Rimming Steel Ingots," by A. Hultgren, professor of metallography, Institute of Technology, and G. Phragmen, Metallografiska institutet, Stockholm, Sweden.

"Mechanism of Solidification and Segregation in a Low-Carbon Rimming Steel Ingot," by Anson Hayes, director of research, American Rolling Mill Co., Middletown, O., and John Chipman, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

**Tuesday, Oct. 18**

10:00 A. M.—Book-Cadillac Hotel

**Institute of Metals Division**

*Bronzes and Bearing Alloys*

"Effect of Silver Additions on Physical Properties of the Tin-Bronzes," by A. J. Dornblatt, senior research associate, S. V. Wilson, research associate, and A. M. Setapen, research associate, national bureau of standards, Washington.

"Microhardness of Bearing Alloys," by L. L. Swift, control metallurgist, Cleveland Graphite Bronze Co., Cleveland.

"Possibilities of Silver-Rich Alloys as Bearing Materials," by R. W. Dayton, metallurgist, Battelle Memorial institute, Columbus, O.

10:00 A. M.—Book-Cadillac Hotel

**Iron and Steel Division**

*Mechanical Properties and Metallography of Iron*

"Effect of Phosphorus on Properties of Iron," by Heihachi Kamura, doctor of engineering, Meji College of Technology, Japan.

"Fracture of Steels at Elevated Temperatures," by R. H. Thielmann, research laboratories, and E. R. Parker, research metallurgist, General Electric Co., Schenectady, N. Y.

**Robert F. Mehl**

Chairman, Institute of Metals Division, American Institute of Mining and Metallurgical Engineers. He is head, department of metallurgy, and director, metals research laboratories, Carnegie Institute of Technology, Pittsburgh

"Structure of Iron After Compression," by Charles S. Barrett, physicist, Carnegie Institute of Technology, Pittsburgh.

12:15 P. M.—Book-Cadillac Hotel

Luncheon meeting of Open Hearth executive committee.

(*Please turn to Page* 194)

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# TECHNICAL PROGRAM

WIRE ASSOCIATION

**Monday, Oct. 17**

2:30 P. M.—DETROIT-LELAND HOTEL

*Steel Division*

"Resilience of Spring Materials," by R. R. Tatnal, engineer, Wickwire Spencer Steel Co., Worcester, Mass.

2:30 P. M.—DETROIT-LELAND HOTEL

*Nonferrous Division*

"Notes on Annealing of Copper Wire," by L. B. Barker, testing engineer, General Electric Co., Schenectady, N. Y.

"Chromium Copper Alloy Wire," by C. H. Davis, metallurgist, American Brass Co., Waterbury, Conn.

"Manufacture of Oil-Filled Cable," a motion picture by General Electric Co., Schenectady, N. Y.

**Tuesday, Oct. 18**

9:30 A. M.—DETROIT-LELAND HOTEL

*Steel Division*

"Principles of Metallurgy," by B. L. McCarthy, metallurgist, Wickwire Spencer Steel Co., Buffalo.

"Wire Cloth, Its Many Kinds and Uses," by R. B. Roth, purchasing agent, Ludlow-Saylor Wire Co., St. Louis.

2:00 P. M.—DETROIT-LELAND HOTEL

*Nonferrous Division*

"Heating Copper Wire Bars," by J. A. Doyle, vice president and heating engineer, W. S. Rockwell Co., New York.

"Aluminum Coated Steel Wire," by Prof. Colin G. Fink, electrochemist, Columbia university, New York.

"Development of High-Strength Electrical Conductors and Messenger Cable," by C. H. Davis, assistant technical director, and Ira T. Hook, research engineer, American Brass Co., Waterbury, Conn.

2:00 P. M.—DETROIT-LELAND HOTEL

*Steel Division*

"Effect of Under Critical Annealing Treatments on Cold Drawn Steels," by F. C. Brandon, metallurgist, Union Drawn Steel division, Republic Steel Corp., Massillon, O.

"Some Characteristics of Wire and Their Relation to Cold Heading," by H. L. Hopkins, metallurgist, National Screw & Mfg. Co., Cleveland.

**Wednesday, Oct. 19**

9:30 A. M.—DETROIT-LELAND HOTEL

"Thermal Reactions," by B. L. McCarthy, metallurgist,, Wickwire Spencer Steel Co., Buffalo.

"Acid Disposal Symposium," by L. F. Marek, chemical engineer, Arthur D. Little Inc., Cambridge, Mass.; S. F. Spangler, chemical engineer, Chemical Construction Corp., New York; and Dr. Otto Mantius, consulting engineer, acid recovery department, National Lead Co., New York.

12:30 P. M.—DETROIT-LELAND HOTEL

Luncheon. Speaker: Louis Johnson, assistant secretary of war, Washington.

3:30 P. M.—DETROIT-LELAND HOTEL

*Annual Meeting*

Reports of officers.

Award of Wire association medal.

7:00 P. M.—DETROIT-LELAND HOTEL

Annual dinner and entertainment.

**Thursday, Oct. 20**

9:45 A. M.—DETROIT-LELAND HOTEL

*Steel Division*

"Metallurgy of Steel Wire," by B. L. McCarthy, metallurgist, Wickwire Spencer Steel Co., Buffalo.

"Stainless Steel Wire," by J. K. Findley, metallurgist, Allegheny-Ludlum Steel Corp., Dunkirk, N. Y.

2:00 P. M.—DETROIT-LELAND HOTEL

*Steel Division*

"Rope Wire," by W. R. Bloxdorf, metallurgist, MacWhyte Co., Kenosha, Wis.

"Wire Rope," by H. K. Hammerstein, chief engineer, Broderick & Bascom Rope Co., St. Louis.

**Frederick A. Westphal**

President, Wire Association. He is superintendent of wire mills, Sheffield Steel Corp., Kansas City, Mo.

## Technical Program of Metallurgical Engineers

(*Continued from Page* 192)

2:00 P. M.—BOOK-CADILLAC HOTEL

**Institute of Metals Division**

*Aluminum Alloys and Age Hardening*

"Effect of Plastic Deformation on Age Hardening of Duralumin," by Robert W. Lindsay, department of metallurgy, and John T. Norton, associate professor of physics of metals, Massachusetts Institute of Technology, Cambridge, Mass.

"Age Hardening of Duralumin," by Morris Cohen, assistant professor, Massachusetts Institute of Technology, Cambridge, Mass.

"Solubility of Lead and Bismuth in Liquid Aluminum and Aluminum-Copper Alloys," by L. W. Kempf, metallurgist, and Kent R. Van Horn, research metallurgist, Aluminum Co. of America, Cleveland.

2:00 P. M.—BOOK-CADILLAC HOTEL

**Iron and Steel Division**

*Thermal Transformations and Thermal Expansion*

"Kinetics of Decomposition of Austenite at Constant Temperature," by J. B. Austin and R. L Rickett, research laboratory, United States Steel Corp., Kearny, N. J.

"Thermal Expansion of Nickel-Iron Alloys (Nickel 30-70 Per Cent)," by J. M. Lohr, manager, research laboratory, and Charles H. Hopkins, metallurgist, Driver-Harris Co., Harrison, N. J.

"Low-Temperature Transformation in Fe-Ni-Co Alloys," by L. L. Wyman, research laboratories, General Electric Co., Schenectady, N. Y.

7:30 P. M.—BOOK-CADILLAC HOTEL

Annual dinner of Institute of Metals and Iron and Steel divisions.

**Wednesday, Oct. 19**

12:15 P. M.—BOOK-CADILLAC HOTEL

Luncheon meeting of Iron and Steel division executive committee.

2:00 P. M.—BOOK-CADILLAC HOTEL

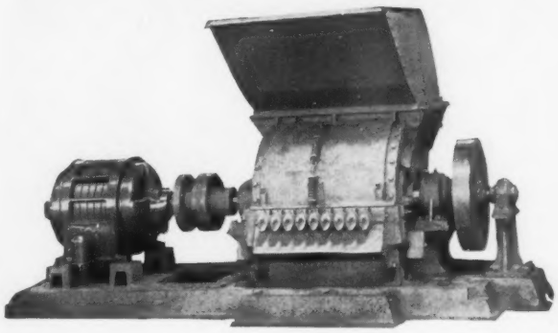
**Institute of Metals Division**

*Metallography and Corrosion: Copper, Aluminum, Tin*

"Tarnish Films on Copper," by J. B. Dyess and Henry A. Miley, Oklahoma Agricultural and Mechanical college, Stillwater, Okla.

"Equilibrium Relations in Aluminum-Zirconium Alloys of High

# BIG RETURNS
## ON A SMALL INVESTMENT



No. 3800 American Steel Turnings Crusher with hopper mounted on bed plate. (Patented)

Feed Platform with Steel Turnings

Many shops and manufacturing plants are making extra profits by crushing their turnings into chips with AMERICAN RING STEEL TURNING CRUSHERS. Chips not only bring a higher price but are easier to handle, require less storage space and are easier to ship.

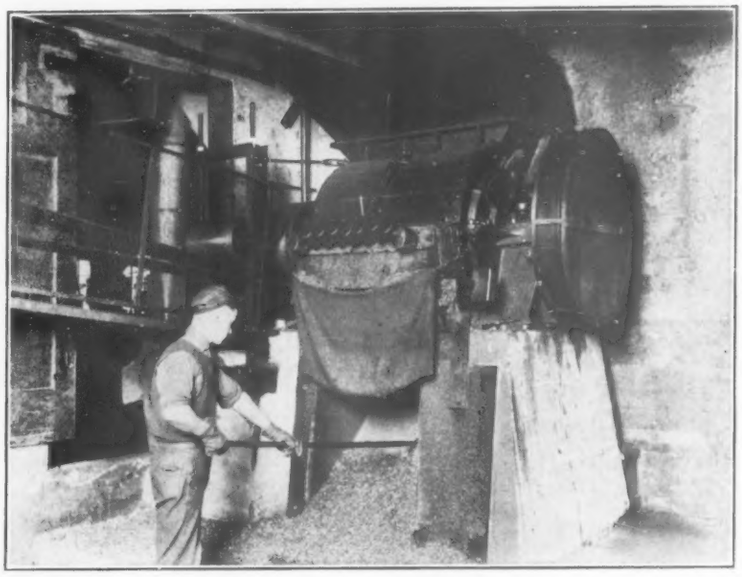
Your long turnings will cease to be a nuisance after you put an AMERICAN RING CRUSHER on the job. It will pay for itself in a very short time after which it will pay you a steady profit.

Do you want this EXTRA profit?

Write us for full particulars.

***American Ring Crushers are crushing run of mine coal to stoker size at maintenance cost as low as 1/10 of a cent a ton.***

We manufacture a complete line of reduction equipment. Put your problems up to us.



A Typical Installation

**ORIGINATORS OF THE ROLLING RING CRUSHER PRINCIPLE**

# AMERICAN PULVERIZER CO.

**1539 Macklind Ave., St. Louis, Mo.**

Purity," by William L. Fink, research metallurgist, and L. A. Willey, research laboratories, Aluminum Co. of America, New Kensington, Pa.

"Special Method for Polishing Metal Specimens for Metallographic Examination," by D. Bergekoff and W. D. Forgeng, Union Carbide & Carbon Research Laboratories Inc., Niagara Falls, N. Y.

"Studies Upon the Corrosion of Tin, II—Effects of Other Anions in Carbonate Solutions," by Gerhard Derge, assistant metallurgist, and Harold Markus, metals research laboratory, Carnegie Institute of Technology, Pittsburgh.

## Welding Society's Technical Program

(*Concluded from Page* 190)

Inge Lyse and E. H. Mount, Lehigh university, Bethlehem, Pa.

"Residual Stresses Due to Circumferential Welds in Pipes," by E. L. Eriksen, University of Michigan, Ann Arbor, Mich.

"Welding Arcs from the Standpoint of Recent Investigations," by Dr. C. G. Suits, research laboratory, General Electric Co., Schenectady, N. Y.

2:00 P. M.—Book-Cadillac Hotel

*Welding and Cutting Processes*

"Quality and Efficiency in Oxygen Cutting," by George M. Deming, Air Reduction Sales Co., New York.

"Bi-Metal Construction of High Temperature Steel Valves," by E. R. Seabloom, Crane Co., Chicago.

"Weld Penetration," by John Hruska, Electro-Motive Corp., La Grange, Ill.

"Bronze Welding," by W. S. Walker, Linde Air Products Co., New York.

2:00 P. M.—Book-Cadillac Hotel

*Fundamental Research*

"Photoelastic Analysis of Stresses in Lap Plates of Welded Joints," by A. G. Solakian, Polarized Light Co.

"Metallurgical Aspects of Resistance Welding Electrodes," by Dr. R. F. Harrington, research laboratory, General Electric Co., Schenectady, N. Y.

"Crater Formation in Arc Welding," by Gilbert E. Doan, Lehigh university, Bethlehem, Pa.

"Stress Distribution in Welds Subjected to Bending," by C. D. Jensen and R. E. Crispen, Lehigh university, Bethlehem, Pa.

7:30 P. M.—Book-Cadillac Hotel

Fundamental research conference.

**Wednesday, Oct. 19**

9:30 A. M.—Book-Cadillac Hotel

*Welding in Machine Design*

"Recent Developments in Welding of Machine Tools," by L. F. Nenninger and W. A. Maddox, Cincinnati Milling Machine Co., Cincinnati.

"Machine Flame Cutting with Small Machines," by Otto C. Voss, Allis-Chalmers Mfg. Co., Milwaukee.

"Welding and Cutting in Machinery Construction," by J. Gordon, Taylor-Winfield Corp., Detroit.

9:30 A. M.—Book-Cadillac Hotel

*Fundamental and Industrial Research*

"Progress in Copper Welding," by Ira T. Hook and Clinton E. Swift, American Brass Co., Ansonia, Conn.

"Carbon Arc Welding of Silicon Bronzes," by E. S. Bunn, J. R. Hunter and W. G. Seidlitz, Revere Copper & Brass Inc., New York.

"Studies of Spot Welding of Low-Carbon and Stainless Steels," by W. F. Hess and R. L. Ringer Jr., Rensselaer Polytechnic institute, Rensselaer, N. Y.

"Shrinkage and Other Initial Stresses in Welds," by M. F. Sayre and E. A. Winzenburger, Union college, Schenectady, N. Y.

**Thursday, Oct. 20**

9:30 A. M.—Book-Cadillac Hotel

*Automotive*

"Flame Hardening with the Oxy-acetylene Flame," by H. J. Shepperd, Kelsey Hayes Wheel Co., Detroit.

"Automobile Body Welding," by E. H. Foss, Murray Corp. of America, Detroit.

"Welding of Rear Axle Housings," by E. L. Bailey and V. Knecht, Chrysler Corp., Detroit.

2:00 P. M.—Book-Cadillac Hotel

*Automotive*

"Resistance Welding in the Automotive Industry," by A. Di Giulio, Ford Motor Co., Dearborn, Mich.

"Automatic Carbon Arc Welding in the Automotive Industry," by F. M. Maichle, Lincoln Electric Co., Detroit.

"Use of Welding in Reconditioning Used Cars," by T. W. Moss, Chrysler Motors Service, Detroit.

"Arc Welding Road Equipment," by Elmer Isgren, R. G. Le Tourneau Inc., Peoria, Ill.

7:00 P. M.—Book-Cadillac Hotel

Dinner. Speaker: W. J. Cameron, Ford Motor Co., Dearborn, Mich.

**Friday, Oct. 21**

9:30 A. M.—Book-Cadillac Hotel

*Ships*

"All-Welded Steel Power Boats," by Milo Bailey, Bailey Steel Shipbuilding Co., Detroit.

"Erection Sequence and Welding Procedure of All-Welded Lake Freighters," by Russell Brendle, Great Lakes Engineering Works, River Rouge, Mich.

"Welding Coast Guard Vessels," by D. E. Whitehouse, Defoe Boat & Motor Works, Bay City, Mich.

9:30 A. M.—Book-Cadillac Hotel

*Railroads*

"Arc Welding of Truss Type Railroad Car," by A. M. Unger, Pullman-Standard Car Mfg. Co., Chicago.

"Flash Welding of Rails," by H. C. Drake, Sperry Products Inc., Brooklyn, N. Y.

"Machine Gas Cutting in a Large Steel Foundry," by W. D. Murray, Canadian Car & Foundry Ltd.; and H. E. Horwood, Railway & Engineering Specialties Ltd., Montreal, Que.

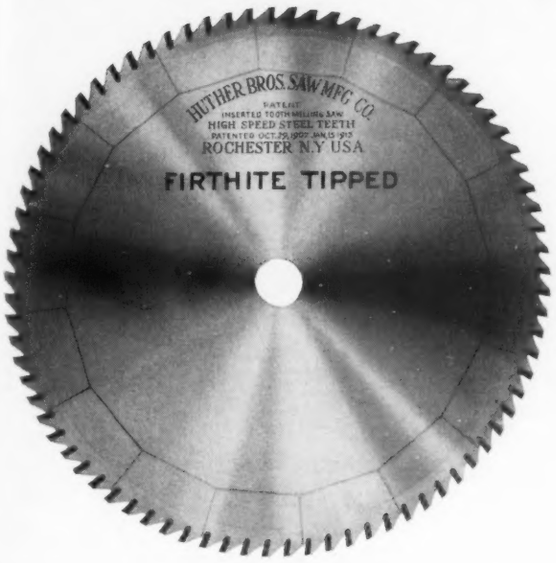
11:30 A. M.—Book-Cadillac Hotel

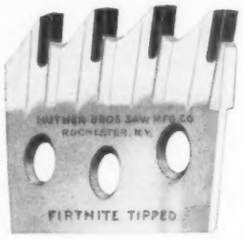
*Business Meeting*

Election of officers.

Report of president.

# HUTHER SAWS




Segment with Firthite tips for Huther Bros. Patent Inserted Tooth Saw.

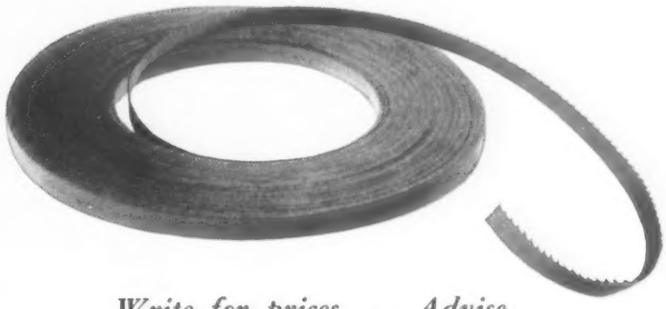
Huther Bros. Patent Inserted Tooth Milling Saw with inserts of best quality High Speed Steel, the ideal saw for cutting brass, copper, and aluminum, leaves cut perfectly smooth —a real production tool. Saw has side clearance, sharpen on top of tooth only. Let us tell you more about this saw.

## FIRTHITE TIPPED SAWS

**FIRTHITE-TUNGSTEN CARBIDE,** made by Firth Sterling Steel Corp., is used for tipping this saw. For cutting non-ferrous metals, fibres, plastics, etc. Write for full information.

• • •

## HUTHER SEMHI HARD EDGE (TRADE MARK) METAL CUTTING BAND SAW



*Write for prices . . . Advise material to be cut and speed*

## HUTHER BROS. SAW MFG. CO.

**ROCHESTER, N. Y.**

# O. H. REFINEMENT PLUS SPEED

***Monarch's three fast cutting, non-alloy steels embody all the refinements of an open hearth composition in its highest quality form and a metallurgical contribution that provides for greater and faster machinability in both standard and special shapes.***

**SPEED CASE X-1515 . . .**

Users of this extra free machining .15 to .20 carbon case hardening steel report increases in production up to more than 50% as compared with the best SAE carburizing steels. SPEED CASE X-1515 is the fastest machining open hearth steel with good physical properties obtainable. It is, furthermore, extremely ductile, permitting severe cold forming operations without fracture. In the case hardened state it has more than 50% greater resistance to impact than standard carburizing grades such as X-1314 or SAE 1015.

**SPEED TREAT X-1535 . . .**

SPEED TREAT X-1535 is in the .30 to .40 carbon range and produces a tensile strength of over 100,000 lbs. in cold drawn, yet it will machine at about the same speed as SAE 1112 Bessemer. We recommend X-1535 wherever a good tough steel is required in combination with free machining, such as in the production of electric motor shafts.

**SPEED TREAT X-1545 . . .**

This grade answers all the requirements of a steel like SAE 1045, yet it is in a class by itself as far as free machining is concerned for a .40 to .50 carbon steel. SPEED TREAT X-1545 enables the manufacturer to produce parts with 110,000 lbs. tensile faster than with any other open hearth steel, regardless of carbon content or tensile strength.

May we mail you complete particulars on any one or all three grades of steel listed?

ROUNDS • SQUARES
HEXAGONS • FLATS
SPECIAL SHAPES

**MONARCH STEEL COMPANY**

INDIANAPOLIS, IND. • CHICAGO • HAMMOND, IND.

*Sole Licensee for Eastern States*

THE FITZSIMONS COMPANY, YOUNGSTOWN, OHIO

## EXPOSITION HOURS

**Monday**.....12:00 M. to 10:30 P.M.
**Tuesday**.....12:00 M. to 10:30 P.M.
**Wednesday**.....12:00 M. to 10:30 P.M.
**Thursday**.....12:00 M. to 6:00 P.M.
**Friday**.....12:00 M. to 10:30 P.M.

**Acme Steel Co.**, Chicago .....A-310
Strip steel in special finishes.

**Aetna-Standard Engineering Co.**, Youngstown, O...C-416
Wire drawing equipment.

**Air Reduction Sales Co.**, New York .....B-515
Oxyacetylene welding and cutting apparatus; oxygen and acetylene.

**Ajax Electric Co. Inc.**, Philadelphia .....B-116
Electric heat treating furnaces.

**Ajax Electrothermic Corp.**, Trenton, N. J. .....B-116
High frequency heat treating and melting furnaces.

**Ajax Metal Co.**, Philadelphia .....B-116
Brass, bronze, nickel and aluminum alloys.

**Allegheny-Ludlum Steel Corp.**, Watervliet, N. Y. .....A-512, C-402
Stainless, heat resisting steels; tool steels; alloy steels.

**Edgar Allen Steel Co. Inc.**, New York .....B-314
Tool and die steels.

**Alox Corp.**, Niagara Falls, N. Y. .....B-408
Corrosion preventatives.

**Aluminum Co. of America**, Pittsburgh ..... B-435
Aluminum alloys.

**American Brass Co.**, Waterbury, Conn. .....C-410
Copper, brass and bronze; welding rods.

**American Bridge Co.**, Pittsburgh .....B-121
Electric furnaces.

**American Car & Foundry Co.**, New York .....C-431
Electric bar, forging and rivet heaters.

**American Coach & Body Co.**, Cleveland .....B-317
Spot welders.

**American Cyanamid & Chemical Corp.**, New York .....B-426
Case hardening compounds; chemicals.

**American Electric Furnace Co.**, Boston .....C-422
Electric and gas heat treating furnaces.

**American Foundry Equipment Co.**, Mishawaka, Ind .....B-542
Airless abrasive cleaning and descaling equipment.

**American Gas Association**, New York.....Gas Section
Industrial gas equipment.

**American Gas Furnace Co.**, Elizabeth, N. J. Gas Section
Gas heat treating furnaces; burners and accessories.

**American Institute of Mining and Metallurgical Engineers**, New York .....B-309
Educational exhibit.

**American Manganese Steel Division, American Brake Shoe & Foundry Co.**, Chicago Heights, Ill. C-251
Manganese steel castings.

**American Rolling Mill Co.**, Middletown, O. .....A-401
Stainless steel; enameling iron; sheets and plates.

**American Screw Co.**, Providence, R. I. .....C-538
Screws with special heads.

**American Steel & Wire Co.**, Cleveland .....B-121
Carbon, alloy and stainless wire; welding wire; bars and strip steel.

**American Welding Society**, New York .....D-313
Educational exhibit.

**Ampco Metal Inc.**, Milwaukee .....C-425
High strength nonferrous alloys.

**Anderson & Sons**, Springfield, Mass. .....B-531
Etched and lithographed metal products.

**Arcos Corp.**, Philadelphia .....A-542
Welding electrodes.

**Armstrong-Blum Mfg. Co.**, Chicago .....A-222
Metal sawing machines; hacksaws; tapping machines.

**Armstrong Cork Co.**, Lancaster, Pa. .....C-141
Insulating firebrick and cements.

**Atlas Foundry Co.**, Detroit .....A-314
Gray iron castings.

## Exhibitors and Products

**Audubon Wire Cloth Corp.**, Philadelphia ..... A-425
Mesh, space and flexible wire cloth; conveyor belts.

**Automatic Gasflux Inc.**, Cleveland ..... C-211
Welding fluxes automatically fed into gas line.

**Babcock & Wilcox Co.**, New York ..... A-252
Refractories.

**Baldwin-Southwark Corp.**, Eddystone, Pa. ..... B-415
Testing machines and accessories.

**W. O. Barnes Co. Inc.**, Detroit ..... C-524
Hacksawing machines; hacksaws.

**Barrett-Cravens Co.**, Chicago ..... C-113
Industrial trucks; materials handling equipment.

**Bastian-Blessing Co.**, Chicago ..... A-105
Gas welding and cutting equipment; accessories.

**Bausch & Lomb Optical Co.**, Rochester, N. Y. ..... A-537
Optical instruments.

**Bellis Heat Treating Co.**, Branford, Conn. ..... D-306
Heat treating salts and furnaces.

**Bethlehem Steel Co.**, Bethlehem, Pa. ..... B-131
Carbon, alloy and corrosion-resisting steels; wire.

**Binks Mfg. Co.**, Chicago ..... C-318
Spray painting equipment; cooling towers.

**Black & Decker Mfg. Co.**, Towson, Md. ..... B-537
Portable electric tools.

**G. S. Blakeslee & Co.**, Cicero, Ill. ..... C-250
Metal cleaning and degreasing machines.

**Botfield Refractories Co.**, Philadelphia ..... C-244
Refractories; high-temperature cements.

**Boyer-Campbell Co.**, Detroit ..... C-506
Face protection equipment.

**Bradley Washfountain Co.**, Milwaukee ..... A-545
Wash fountains and group showers.

**Braeburn Alloy Steel Corp.**, Braeburn, Pa. ..... D-307
Tool and die steels; shear blades.

**Bright Nickel Co.**, Detroit ..... C-535
Bright nickel plating process.

**Bristol Co.**, Waterbury, Conn. ..... B-407
Pyrometers; automatic control equipment.

**Brown Instrument Co. Division, Minneapolis-Honeywell Regulator Co.**, Philadelphia ..... B-508
Pyrometers; automatic control equipment.

**Adolph I. Buehler**, Chicago ..... C-234
Metallographic sample preparation equipment.

**Andrew C. Campbell Division, American Chain & Cable Co.**, Bridgeport, Conn. ..... C-515
Cut-off machines.

**Carboloy Co. Inc.**, Detroit ..... B-203
Cemented carbide tools and dies.

**Carborundum Co.**, Niagara Falls, N. Y., and Perth Amboy, N. J. ..... A-509
Abrasives; grinding and cutting wheels; nonmetallic electric heating elements; refractories.

**Carnegie-Illinois Steel Corp.**, Pittsburgh ..... B-121
Carbon, alloy, high tensile and stainless steels.

**Carpenter Steel Co.**, Reading, Pa. ..... B-259
Tool and die steels.

**Chapman Valve Mfg. Co.**, Indian Orchard, Mass. ..... A-431
Surface hardening equipment.

**Chase Brass & Copper Co.**, Waterbury, Conn. ..... A-519
Copper, brass and bronze; welding rods.

**Climax Molybdenum Co.**, New York ..... C-432
Molybdenum alloy steels and irons.

**Columbia Steel Co.**, San Francisco ..... B-121
Carbon, alloy, high tensile and stainless steels.

**Continental Industrial Engineers Inc.**, Chicago ..... B-144
Heat treating systems.

**Continental Machine Specialties Inc.**, Minneapolis ..... B-548
Precision filing and sawing machines.

**Crown Rheostat & Supply Co.**, Chicago ..... B-307
Plating and polishing equipment.

**Crucible Steel Co. of America**, New York ..... B-225
Tool steels; stainless and corrosion resisting steels.

**Cyclone Fence Co.**, Waukegan, Ill. ..... B-121
Steel fence; wire products.

*DAILY METAL TRADE*, Cleveland ..... A-203
Publications and technical books.

**Darwin & Milner Inc.**, Cleveland ..... A-250
Tool and die steels.

**Dayton-Rogers Mfg. Co.**, Minneapolis ..... B-532
Metal stamping process.

**A. P. de Sanno & Son Inc.**, Philadelphia ..... A-107
Grinding wheels; cut-off machines.

**Despatch Oven Co.**, Minneapolis ..... Gas Section
Gas heat treating furnaces.

**Detroit Rex Products Co.**, Detroit ..... B-545
Metal cleaning equipment.

**Detroit Testing Machine Co.**, Detroit ..... B-306
Physical testing machines and accessories.

**Harry W. Dietert Co.**, Detroit ..... C-448
Spectrographic equipment; sand testing equipment.

**Dow Chemical Co.**, Midland, Mich. ..... C-115
Magnesium alloys.

**Driver-Harris Co.**, Harrison, N. J. ..... B-251
Heat and corrosion-resisting alloys.

**E. I. du Pont de Nemours & Co. Inc.**, Wilmington, Del. ..... A-501
Heat treating salts; pickling inhibitors; metal cleaners; plating chemicals, fluxes; acids.

**Eberbach & Son Co.**, Ann Arbor, Mich. ..... A-523
Metallographic polishing machines.

**Ecco High Frequency Corp.**, New York ..... C-508
Induction heating equipment.

**Eclipse Fuel Engineering Co.**, Rockford, Ill. ..... Gas Section
Gas heat treating furnaces and accessories.

**Electric Furnace Co.**, Salem, O. ..... B-405
Oil, gas and electric heat treating furnaces.

**Electro Alloys Co.**, Elyria, O. ..... A-411
Heat and corrosion-resisting alloys.

**Electro Metallurgical Co.**, New York ..... B-216
Alloy elements for iron and steel.

**Electronic Control Corp.**, Detroit ..... D-316
Electronic control and inspection equipment.

**Ensign-Reynolds Inc.**, New York ..... Gas Section
Gas burning equipment; melting furnaces.

**A. Finkl & Sons Co.**, Chicago ..... B-416
Die blocks and forgings.

**Firth-Sterling Steel Co.**, McKeesport, Pa. ..... A-217
Cemented carbide tools and dies; stainless and wear-resisting steels.

**Fitzsimons Co.**, Youngstown, O. ..... B-446
Cold finished steel bars.

**J. B. Ford Sales Co.**, Wyandotte, Mich. ..... C-309
Metal cleaners; burnishing compounds.

*THE FOUNDRY*, Cleveland ..... A-203
Publications and technical books.

**Foxboro Co.**, Foxboro, Mass. ..... A-303
Measuring and control instruments.

**Gathmann Engineering Co.**, Baltimore ..... B-105
Ingot molds.

**General Alloys Co.**, Boston ..... B-204
Heat and corrosion-resisting alloys.

**General Electric Co.**, Schenectady, N. Y. ..... A-109
Electric furnaces; electric welding machines.

**General Electric X-Ray Corp.**, Chicago ..... A-109
X-ray inspection equipment.

**Gogan Machine Corp.**, Cleveland ..... D-308
Hardness testing machines.

**Claud S. Gordon Co.**, Chicago ..... B-306
Pyrometers, thermocouples and accessories.

**Great Lakes Steel Corp.**, Detroit ..... A-317
Sheet and strip steel; alloy steels.

**Halcomb Steel Co.,** Syracuse, N. Y. ..... B-225
Tool steels; alloy steels.

**Handy & Harman,** New York ..... A-525
Brazing alloys; silver solders; powdered metals.

**Hauck Mfg. Co.,** Brooklyn, N. Y. ..... C 140
Oil and gas burners; regulating valves.

**C. I. Hayes Inc.,** Providence, R. I. ..... A-508
Electric heat treating furnaces.

**Haynes-Stellite Co.,** Kokomo, Ind. ..... B-215
Cutting tools; corrosion-resistant castings.

**Heppenstall Co.,** Pittsburgh ..... C-426
Die blocks; forgings; automatic lifting devices.

**Hevi Duty Electric Co.,** Milwaukee ..... C-446
Electric heat treating furnaces.

**Hobart Bros. Co.,** Troy, O. ..... C-208
Electric arc welding equipment.

**A. F. Holden Co.,** New Haven, Conn. ..... C-124
Heat treating baths.

**Hollup Corp. and Compressed Industrial Gases Inc.,**
Chicago ..... B-252
Welding and cutting apparatus; electrodes.

**Charles A. Hones Inc.,** Baldwin, N. Y. ..... Gas Section
Gas furnaces, burners and accessories.

**Hoskins Mfg. Co.,** Detroit ..... A-251
Heating element alloys.

**E. F. Houghton & Co.,** Philadelphia ..... C-221
Heat treating salts; lubricants; cutting oil; belting.

**Illinois Testing Laboratories Inc.,** Chicago ..... B-143
Pyrometers; thermometers; control equipment.

**Illinois Tool Works,** Chicago ..... A-436
Cutters; hobs; broaches.

**Industrial Heating Equipment Co.,** Detroit .. Gas Section
Gas heat treating furnaces.

**International Nickel Co. Inc.,** New York ..... C-226
Nickel and nickel alloys.

**Jackson Electrode Holder Co.,** Detroit ..... D-312
Welding electrode holders; eyeshields.

**Jessop Steel Co.,** Washington, Pa. ..... C-441
Tool steels; alloy steels; stainless steels.

**Johns-Manville,** New York ..... C-256
Insulating and refractory materials.

**Jones & Laughlin Steel Corp.,** Pittsburgh ..... A-231
Hot and cold finished steels; wire; tin plate.

**J. W. Kelley Co.,** Cleveland ..... C-507
Heat treating products; industrial oils.

**M. W. Kellogg Co.,** Jersey City, N. J. ..... C-523
Bonded steel-corrosion-resisting alloy plates.

**C. M. Kemp Mfg. Co.,** Baltimore ..... Gas Section
Gas generators; immersion heating units; accessories.

**Krembs & Co., Chicago** ..... C-520
Welding equipment; welding gases.

**Krouse Fatigue Testing Machine Co.,**
Columbus, O. ..... C-407
Fatigue testing machines.

**LaSalle Steel Co.,** Chicago ..... B-442
Cold finished steels.

**Latrobe Electric Steel Co.,** Detroit ..... C-510
Tool steels; stainless steels.

**Lava Crucible Co. of Pittsburgh,** Pittsburgh ..... C-206
Refractories; cements; crucibles.

**Leeds & Northrup Co.,** Philadelphia ..... C-218
Heat treating furnaces; control instruments.

**E. Leitz Inc.,** New York ..... C-528
Photomicrographic apparatus.

**Lepel High Frequency Laboratories,** New York ... A-118
High frequency generators; furnaces.

**Lima Armature Works,** Lima, O. ..... B-409
Electric motors; magnetic separators.

**Lincoln Electric Co.,** Cleveland ..... A-532
Electric arc welders; electrodes; motors.

**Lindberg Engineering Co.,** Chicago ..... B-250
Heat treating furnaces; control equipment.

**Linde Air Products Co.,** New York ..... B-221
Oxyacetylene welding and cutting apparatus; oxygen and acetylene.

*MACHINE DESIGN,* Cleveland ..... A 203
Publications and technical books.

**Macklin Co.,** Jackson, Mich. ..... A-415
Grinding wheels; cut-off machines.

**Paul Maehler Co.,** Chicago ..... Gas Section
Gas-fired drying and baking ovens.

**Magnaflux Corp.,** Chicago ..... C-109
Magnetic inspection method and equipment.

**Magnetic Analysis Corp.,** Long Island City, N. Y. .. A-213
Magnetic analysis and inspection equipment.

**Mahr Mfg. Co. Division, Diamond Iron Works Inc.,**
Minneapolis ..... B-535
Oil and gas furnaces; burners.

**P. R. Mallory & Co. Inc.,** Indianapolis ..... A-437
Welding electrode tips; electrical contacts.

**Manganese Steel Forge Co.,** Philadelphia ..... A-425
Manganese steel wire cloth; screens; forgings; welding wire.

**Manhattan Rubber Mfg. Division, Raybestos-Manhattan Inc.,** Passaic, N. J. ..... A-420
Abrasive cut-off wheels; finishing wheels.

**Marburg Bros. Inc.,** New York ..... D-317
Metal cutting, sawing and filing machines; gages.

**Marquette Mfg. Co.,** Minneapolis ..... A 442
Electric welding machines.

**Maurath Inc.,** Cleveland ..... A-426
Welding electrodes.

**McKay Co.,** Pittsburgh ..... C-548
Welding electrodes; industrial chain.

**Metal & Thermit Corp.,** New York ..... B-502
Welding electrodes; thermit welding materials.

**Metals Disintegrating Co. Inc.,** Elizabeth, N. J. .... C-306
Metal powders.

**Michiana Products Corp.,** Michigan City, Ind .... A-239
Heat and corrosion-resistant alloy castings.

**Michigan Steel Casting Co.,** Detroit ..... C-241
Heat and corrosion-resisting castings.

**Midvale Co.,** Philadelphia ..... C-233
Forgings; corrosion-resisting castings.

**A. Milne & Co.,** New York ..... B-314
Tool and die steels.

**Molybdenum Corp. of America,** Pittsburgh ..... A-515
Ferroalloys; calcium molybdate; metal powders.

**Monarch Steel Co.,** Indianapolis ..... B-446
Cold drawn steels; shafting.

**National Cylinder Gas Co.,** Chicago ..... C-118
Oxyacetylene cutting and flame hardening machines.

**National Electric Welding Machines Co.,**
Bay City, Mich ..... A-307
Electric spot and seam welding machines.

**National Tube Co.,** Pittsburgh ..... B-121
Seamless and welded tubular products.

**New Jersey Zinc Co.,** New York ..... B-106
Zinc alloys; die castings.

**Norton Co.,** Worcester, Mass ..... A-242
Grinding wheels; abrasives; refractories.

**Oakite Products Inc.,** New York ..... C-114
Industrial cleaning materials.

## Exhibitors and Products

**Ohio Crankshaft Co.,** Cleveland ..... B-260
Electric induction hardening process.

**Ohio Steel Foundry Co.,** Springfield, O. ..... A-216
Heat and corrosion-resisting alloy castings.

**Tinius Olsen Testing Machine Co.,** Philadelphia... B-412
Testing machines and accessories.

**Page Steel & Wire Division, American Chain & Cable Co.,** Monessen, Pa. ..... C-515
Welding wire.

**Pangborn Corp.,** Hagerstown, Md. ..... A-131
Blast cleaning and dust collecting equipment.

**Park Chemical Co.,** Detroit ..... C-202
Heat treating materials; buffing, polishing materials.

**Parker-Kalon Corp.,** New York ..... C-419
Screws and fastening devices.

**Parker Rust-Proof Co.,** Detroit ..... C-535
Rust prevention treatment.

**Partlow Corp.,** New Hartford, N. Y. ..... Gas Section
Temperature controls; gas valves; safety pilots.

**Production Machine Co.,** Greenfield, Mass. ..... C-509
Polishing, finishing and buffing machines.

**Pyro-Electro Instrument Co.,** Detroit ..... C-534
Hardness testing machines.

**Pyrometer Instrument Co.,** New York ..... A-114
Pyrometers and accessories.

**Quigley Co. Inc.,** New York ..... A-245
Refractories.

**Reeves Pulley Co.,** Columbus, Ind ..... B-420
Variable-speed transmission equipment.

**Republic Steel Corp.,** Cleveland ..... B-231
Alloy and stainless steels; sheet and strip; bolts and nuts; pig iron.

**Riehle Testing Machine Division, American Machine & Metals Inc.,** East Moline, Ill. ..... B-445
Testing machines and accessories.

**Robinson Welding Supply Co.,** Detroit ..... A-543
Electric and gas welding equipment.

**Rustless Iron & Steel Corp.,** Baltimore ..... B-419
Stainless steels and irons.

**Joseph T. Ryerson & Son Inc.,** Chicago ..... B-406
Steel and allied products.

**George Scherr Co. Inc.,** New York ..... A-445
Optical instruments; testing machines.

**Scully Steel Products Co.,** Chicago ..... B-121
Carbon, alloy, high tensile and stainless steels.

**Selas Co.,** Philadelphia ..... Gas Section
Gas premixers; burners; soldering systems.

**Sentry Co.,** Foxboro, Mass. ..... B-402
Hardening furnaces; high-temperature tube furnaces.

**Shakeproof Lock Washer Co.,** Chicago ..... A-436
Lock washers and screws.

**Sleeper & Hartley Inc.,** Worcester, Mass ..... C-215
Wire and spring making machinery.

**Spencer Turbine Co.,** Hartford, Conn. ..... C-144
Turbo compressors; vacuum cleaners.

*STEEL,* Cleveland ..... A-203
Publications and technical books.

**Steel City Testing Laboratory,** Detroit ..... A-223
Testing machines and accessories.

**Stirling Detroit Corp.,** Detroit ..... Gas Section
Gas burners; mixers; accessories.

**D. A. Stuart Oil Co. Ltd.,** Chicago ..... C-238
Industrial oils and greases.

**Super Tool Co.** Detroit ..... A-253
Tools.

**Surface Combustion Corp.,** Toledo, O. ..... Gas Section
Gas heat treating furnaces, burners; accessories.

**C. J. Tagliabue Mfg. Co.,** Brooklyn, N. Y. ..... C-435
Pyrometers; thermometers; control apparatus.

**Tennessee Coal, Iron & Railroad Co.,** Birmingham, Ala. ..... B-121
Carbon, alloy, high tensile and stainless steels.

**Thermek Corp.,** Chicago ..... B-411
Heat transfer elements.

**Thomas Steel Co.,** Warren, O. ..... A-443
Cold rolled and specially finished strip steels.

**Henry G. Thompson & Son Co.,** New Haven, Conn. C-254
Metal cutting saws; hacksaws.

**Tide Water Associated Oil Co.,** New York ..... C-531
Cutting oils.

**Titanium Alloy Mfg. Co.,** Niagara Falls, N. Y. ..... A-212
Titanium alloys and compounds.

**Torrington Mfg. Co.,** Torrington, Conn. ..... A-524
Wire manufacturing machines.

**Una Welding Inc.,** Cleveland ..... A-432
Arc welding machines; electrodes.

**Union Carbide Co.,** New York ..... B-215, B-216, B-221
Welding and cutting equipment; ferroalloys; heat and corrosion-resisting alloys.

**Unitcast Corp.,** Toledo, O. ..... A-259
Steel castings.

**United States Steel Corp.,** Pittsburgh ..... B-121
Carbon, alloy, high tensile and stainless steels.

**Universal-Cyclops Steel Corp.,** Bridgeville, Pa. ..... A-516
Tool steels; stainless and specialty steels.

**Universal High-Speed Tool Co.,** Chicago ..... C-518
Universal milling heads; duplicating units.

**Vanadium Corp. of America,** New York ..... C-246
Vanadium alloys and compounds.

**Victor Saw Works Inc.,** Middletown, N. Y. ..... A-416
Hacksaw machines; hacksaw blades.

**Vulcan Crucible Steel Co.,** West Aliquippa, Pa. ..... A-143
Tool steels; special steels.

**Wall Colmonoy Corp.,** Detroit ..... B-441
Hard facing materials; cutting tools.

**Wells Mfg. Corp.,** Three Rivers, Mich. ..... C-525
Metal cutting bandsaws.

**Westinghouse Electric & Mfg. Co.,** East Pittsburgh, Pa. ..... C-132
Welding equipment; electric furnaces.

**Wheelco Instruments Co.,** Chicago ..... A-306
Temperature control instruments.

**Wilcox-Rich Division, Eaton Mfg. Co.,** Detroit .... D-310
Corrosion and wear-resisting cast alloys.

**H. A. Wilson Co.,** Newark, N. J. ..... A-243
Precious metals; thermostatic metals; special alloys.

**Wilson Mechanical Instrument Co. Inc.,** New York ..... C-442
Hardness testing machines.

**Wilson Welder & Metals Inc.,** North Bergen, N. J.. B-515
Electric welding machines; electrodes.

**Wire Association,** New York ..... C-544
Educational exhibit.

**Youngstown Sheet & Tube Co.,** Youngstown, O... A-531
Alloy steels; sheets; bars; tubing.

**Carl Zeiss Inc.,** New York ..... B-211
Metallographic equipment and accessories.

**Ziv Steel & Wire Co.,** Chicago ..... A-250
Tool and die steels.

# A BETTER LIFTING MAGNET

## By a company which has specialized in magnetic equipment for 40 YEARS!

BUILT by magnetic experts—the Dings High Intensity Lifting Magnet brings a new maximum in lifting power, ruggedness, economy and long life.

For more than *40 years*, the entire resources of the Dings organization have been devoted exclusively to building better magnetic equipment.

The results of these years of experience, development and research are built into every inch of the Dings High Intensity Lifting Magnet. Here are just a few of its outstanding features of design which will cut your material handling costs to a new low:

**ANCHORED COIL**
Coil is bolted to body of magnet (a great percentage of magnet failures can be traced to movement of the coil)—*no other lifting magnet is built this way!*

**HEAVIER BODY**
Insures greater strength, and less risk of breakage.

**GREATER RADIATING SURFACE**
Large fins on body insure cooler operation, more power.

**HEAVIER OUTER POLE**
Smooth surfaces absorb shock, reduce risk of breakage.

**IMPROVED INNER POLE**
Extra heavy center pole attached to body by protected and locked bolts—can be removed without disturbing other parts.

**WATERPROOF COIL**
No moisture can get in to cause electrical trouble—coil is heavily impregnated under pressure.

**MORE COIL SPACE**
More wire can be used—*lifting power is increased*—more pay load.

**DINGS MAGNETIC SEPARATOR CO.**
**663 Smith Street :: Milwaukee, Wis.**

**SEPARATORS**
Exclusive features of design make Dings Magnetic Separators the most powerful separators on the market, size for size. Bronze coil covers and individual coil spools with bronze spacers mean more pull . . . corrugated radial openings, longitudinal openings and heat radiating vanes mean cooler operation, more power. For better separation, specify Dings.

**MILL TYPE CLUTCHES**

Simple, rugged, tough—Dings Magnetic Clutches have solved the problems of remote control, safety synchronization, slippage and end thrust for the nation's leading steel mills.
Find out about them!

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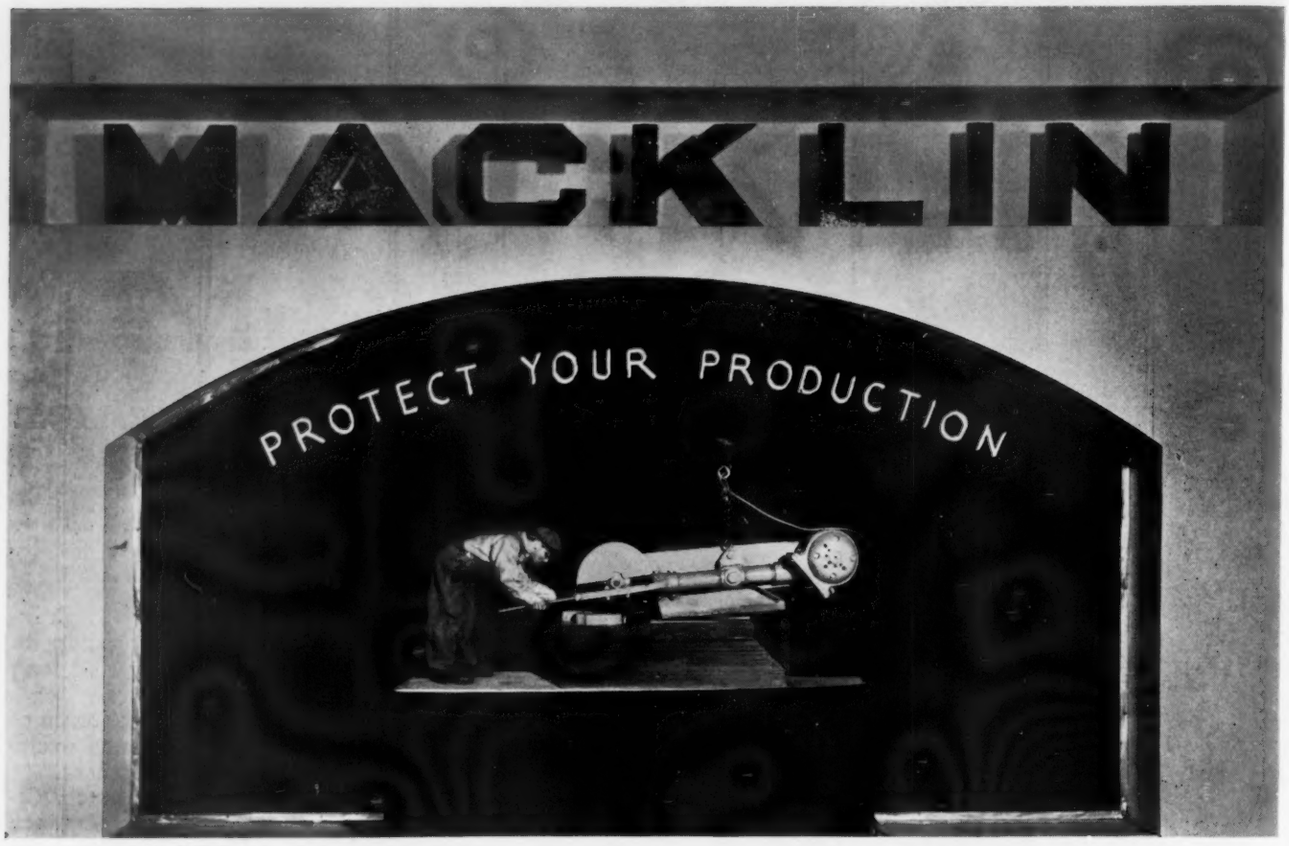
*A postcard request will bring you a 16 page catalog on the new Dings High Intensity Lifting Magnet. Send for it today!*




# ....AND SPARKS REALLY FLY

They fly, in fiery arcs, from Macklin's miniature swing frame grinder which will be in continuous operation at the Metal Show. The many who see its dramatic action story will know that Macklin Grinding Wheels are efficiently used on all kinds of grinding jobs. Protecting production throughout industry Macklin Wheels are made in all sizes, shapes, grains and grades.

DURABLE — DEPENDABLE — ECONOMICAL

*See this unusual exhibit in operation at the National Metal Exposition . . . Booth A 415*

## MACKLIN COMPANY

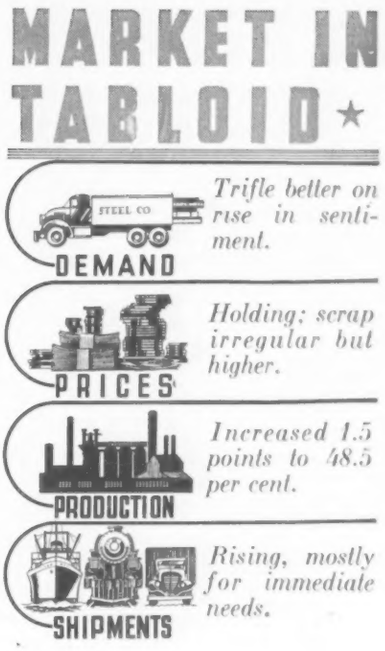
Manufacturers of GRINDING WHEELS—JACKSON, MICHIGAN, U. S. A.

*Sales Offices:*—Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

**MACKLIN**
**Grinding Wheels**

# Production At New Peak; Demand Gains

## Auto Needs Lead As Steel Releases Improve




■ IMPROVED sentiment on the fading of the European war spectre has been followed by a moderate rise in steel specifications and a small recovery in ingot production, pushing output to the best level for the year to date.

Betterment in demand has been reflected more in releases against old orders than in new business, except for some track material buying, as consumers continue to refrain from extensive forward coverage. With steel moving promptly into use and with stocking by mills now restricted, subsequent expansion in consumption will be reflected quickly in steelworks operations.

Whether uncertainty induced by war threats primarily was responsible for the recent leveling off in steel demand, or whether the lull merely represented a breathing spell after the sharp July-August upturn, is debatable. The fact that war talk was accompanied by only a small slowing down in activity, however, is regarded as indicative of the strength behind the recovery of the past three months, particularly in view of the prompt turn for the better upon the easing of tension in Europe.

Gains in automotive requirements are responsible for a large part of the recent upturn in steel shipments, although building work and miscellaneous users are providing substantial support. Operations of some farm equipment manufacturers are headed upward after a quiet summer, particularly in the tractor division, and will help to bolster steel demand this quarter.

Steelmaking rose 1.5 points last week to 48.5 per cent, more than wiping out the preceding week's dip and touching a new high since October, 1937. Leading the upturn were Youngstown, with a 6-point gain to 55 per cent, and Chicago, up 3 points to 44.5 per cent. Cleveland rose 2.5 points to 51 per cent and eastern Pennsylvania increased 1 point to 33 per cent.

Except for St. Louis, which reduced 3 points to 45.5 per cent, other districts were unchanged. These included Pittsburgh at 37 per cent, Wheeling at 54, Buffalo at 51, Birmingham at 57, New England at 65, Cincinnati at 43 and Detroit at 72. Several more blast furnaces were blown in the past week.

Steel ingot production in September increased 4.3 per cent over August but was 38 per cent less than a year ago. Output last month was 2,657,748 gross tons, or 46.28 per cent of capacity, compared with 2,546,748 tons in August and 4,289,507 tons in September, 1937. For the first nine months this year, production was 18,005,938 tons, or 57.6 per cent behind the 42,482,597 tons produced the corresponding 1937 period.

Automobile production continues to expand as most interests are pressing for additional assemblies of new models to renew depleted stocks of dealers.

Fourth quarter motor car output is expected to total about 800,000 units. If realized, this would be the largest quarterly production of the year and would compare with 1,061,957 units the last three months of 1937 and 1,154,806 in the 1936 period. A more favorable comparison in steel needs is looked for, however, since a year ago inventories of the automotive industry, as well as other consumers, were substantially above current levels and were partly responsible for the unusually swift drop in steel orders and production.

Freight car orders in September were the second largest for the year to date but remained sharply depressed. For the first nine months, orders were more than 80 per cent behind the corresponding 1937 period, and on the basis of active inquiries no marked recovery is in early prospect. St. Louis-San Francisco railroad is in the market for five locomotives. New York Central has placed 30,500 tons of rails, plus 8000 tons of track fastenings, and while track material demand otherwise is quiet, buying of materials and parts for railroad repairs is broadening gradually.

Scrap prices show an irregular trend, but strength in eastern markets more than offset weakness at Chicago and raised the scrap composite 16 cents to $14.04. The scrap advance boosted the iron and steel composite 3 cents to $36.61, while the finished steel composite was unchanged at $57.20.

# COMPOSITE MARKET AVERAGES

| | Oct. 8 | Oct. 1 | Sept. 24 | One Month Ago Sept., 1938 | Three Months Ago July, 1938 | One Year Ago Oct., 1937 | Five Years Ago Oct., 1933 |
|---|---|---|---|---|---|---|---|
| Iron and Steel .... | $36.61 | $36.58 | $36.44 | $36.48 | $36.32 | $39.59 | $30.53 |
| Finished Steel .... | 57.20 | 57.20 | 57.20 | 57.20 | 57.20 | 61.70 | 49.20 |
| Steelworks Scrap.. | 14.04 | 13.88 | 14.13 | 14.23 | 13.06 | 15.93 | 10.37 |

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

# COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

## Finished Material

| | Oct. 8, 1938 | Sept. 1938 | July 1938 | Oct. 1937 |
|---|---|---|---|---|
| Steel bars, Pittsburgh | 2.25c | 2.25c | 2.25c | 2.45c |
| Steel bars, Chicago | 2.25 | 2.25 | 2.25 | 2.50 |
| Steel bars, Philadelphia | 2.57 | 2.57 | 2.57 | 2.74 |
| Iron bars, Terre Haute, Ind. | 2.15 | 2.15 | 2.15 | 2.35 |
| Shapes, Pittsburgh | 2.10 | 2.10 | 2.10 | 2.25 |
| Shapes, Philadelphia | 2.215 | 2.215 | 2.215 | 2.455 |
| Shapes, Chicago | 2.10 | 2.10 | 2.10 | 2.30 |
| Plates, Pittsburgh | 2.10 | 2.10 | 2.10 | 2.25 |
| Plates, Philadelphia | 2.15 | 2.15 | 2.15 | 2.435 |
| Plates, Chicago | 2.10 | 2.10 | 2.10 | 2.30 |
| Sheets, hot-rolled, Pittsburgh | 2.15 | 2.15 | 2.15 | 2.40 |
| Sheets, cold-rolled, Pittsburgh | 3.20 | 3.20 | 3.20 | 3.55 |
| Sheets, No. 24, galv., Pittsburgh | 3.50 | 3.50 | 3.50 | 3.80 |
| Sheets, hot-rolled, Gary | 2.15 | 2.15 | 2.15 | 2.50 |
| Sheets, cold-rolled, Gary | 3.20 | 3.20 | 3.20 | 3.65 |
| Sheets, No. 24, galv., Gary | 3.50 | 3.50 | 3.50 | 3.90 |
| Bright bess., basic wire, Pitts. | 2.60 | 2.60 | 2.60 | 2.90 |
| Tin plate, per base box, Pitts. | $5.35 | $5.35 | $5.35 | $5.35 |
| Wire nails, Pittsburgh | 2.45 | 2.45 | 2.45 | 2.75 |

## Semifinished Material

| | | | | |
|---|---|---|---|---|
| Sheet bars, open-hearth, Youngs. | $34.00 | $34.00 | $34.00 | $37.00 |
| Sheet bars, open-hearth, Pitts. | 34.00 | 34.00 | 34.00 | 37.00 |
| Rerolling billets, Pittsburgh | 34.00 | 34.00 | 34.00 | 37.00 |
| Wire rods, No. 5 to $\frac{9}{32}$-inch, Pitts. | 43.00 | 43.00 | 43.00 | 47.00 |

## Pig Iron

| | Oct. 8, 1938 | Sept. 1938 | July 1938 | Oct. 1937 |
|---|---|---|---|---|
| Bessemer, del. Pittsburgh | $22.34 | $21.34 | $21.34 | $25.26 |
| Basic, Valley | 20.50 | 19.50 | 19.50 | 23.50 |
| Basic, eastern, del. Philadelphia | 22.34 | 21.34 | 21.34 | 25.26 |
| No. 2 foundry, Pittsburgh | 22.21 | 21.21 | 21.21 | 25.21 |
| No. 2 foundry, Chicago | 21.00 | 20.00 | 20.00 | 24.00 |
| Southern No. 2, Birmingham | 17.38 | 16.38 | 16.38 | 20.38 |
| Southern No. 2, del. Cincinnati | 20.89 | 19.89 | 19.89 | 23.69 |
| No. 2X, Del. Phila. (differ. av.) | 23.215 | 22.215 | 22.215 | 26.135 |
| Malleable, Valley | 21.00 | 20.00 | 20.00 | 24.00 |
| Malleable, Chicago | 21.00 | 20.00 | 20.00 | 24.00 |
| Lake Sup., charcoal, del. Chicago | 28.34 | 28.34 | 28.34 | 30.04 |
| Gray forge, del. Pittsburgh | 21.17 | 20.17 | 20.17 | 24.17 |
| Ferromanganese, del. Pittsburgh | 97.77 | 97.77 | 97.77 | 107.29 |

## Scrap

| | | | | |
|---|---|---|---|---|
| Heavy melting steel, Pittsburgh. | $15.00 | $15.25 | $13.75 | $17.15 |
| Heavy melt. steel, No. 2, E. Pa. | 12.75 | 12.75 | 12.20 | 14.01 |
| Heavy melting steel, Chicago | 12.75 | 13.60 | 12.05 | 13.95 |
| Rails for rolling, Chicago | 16.75 | 17.75 | 17.05 | 17.25 |
| Railroad steel specialties, Chicago | 15.75 | 16.60 | 14.95 | 19.35 |

## Coke

| | | | | |
|---|---|---|---|---|
| Connellsville, furnace, ovens | $ 3.75 | $3.75 | $3.75 | $4.40 |
| Connellsville, foundry, ovens | 5.00 | 5.00 | 5.00 | 5.25 |
| Chicago, by-product fdry., del. | 10.50 | 10.50 | 10.80 | 11.00 |

# STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

*Except when otherwise designated, prices are base, f.o.b. cars.*

## Sheet Steel

**Hot Rolled**

| | |
|---|---|
| Pittsburgh | 2.15c |
| Chicago, Gary | 2.15c |
| Cleveland | 2.15c |
| Detroit del. | 2.25c |
| Buffalo | 2.15c |
| Sparrows Point, Md. | 2.15c |
| New York, del. | 2.39c |
| Philadelphia, del. | 2.32c |
| Granite City, Ill. | 2.25c |
| Middletown | 2.15c |
| Youngstown | 2.15c |
| Birmingham | 2.15c |
| Pacific Coast points | 2.65c |

**Cold Rolled**

| | |
|---|---|
| Pittsburgh | 3.20c |
| Chicago, Gary | 3.20c |
| Buffalo | 3.20c |
| Cleveland | 3.20c |
| Detroit, delivered | 3.30c |
| Philadelphia, del. | 3.52c |
| New York, del. | 3.54c |
| Granite City, Ill. | 3.30c |
| Middletown | 3.20c |
| Youngstown | 3.20c |
| Pacific Coast points | 3.80c |

**Galvanized No. 24**

| | |
|---|---|
| Pittsburgh | 3.50c |
| Chicago, Gary | 3.50c |
| Buffalo | 3.50c |
| Sparrows Point, Md. | 3.50c |
| Philadelphia, del. | 3.67c |
| New York, delivered | 3.74c |
| Birmingham | 3.50c |
| Granite City, Ill. | 3.60c |
| Middletown | 3.50c |
| Youngstown | 3.50c |
| Pacific Coast points | 4.00c |

**Tin Mill Black Plate**

| | |
|---|---|
| Pittsburgh | 3.15c |
| Chicago, Gary | 3.15c |
| Granite City, Ill. | 3.25c |

**Long Ternes No. 24 Unassorted**

| | |
|---|---|
| Pittsburgh, Gary | 3.95c |
| Pacific Coast | 4.65c |

**Enameling Sheets**

| | No. 10 | No. 20 |
|---|---|---|
| Pittsburgh | 2.75c | 3.35c |
| Chicago, Gary | 2.75c | 3.35c |
| Granite City, Ill. | 2.85c | 3.45c |
| Youngstown | 2.75c | 3.35c |
| Cleveland | 2.75c | 3.35c |
| Middletown | 2.75c | 3.35c |
| Pacific Coast | 3.35c | 3.95c |

## Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

**Chrome-Nickel**

| | No. 302 | No. 304 |
|---|---|---|
| Bars | 24.00 | 25.00 |
| Plates | 27.00 | 29.00 |
| Sheets | 34.00 | 36.00 |
| Hot strip | 21.50 | 23.50 |
| Cold strip | 28.00 | 30.00 |

**Straight Chromes**

| | No. 410 | No. 430 | No. 442 | No. 446 |
|---|---|---|---|---|
| Bars | 18.50 | 19.00 | 22.50 | 27.50 |
| Plates | 21.50 | 22.00 | 25.50 | 30.50 |
| Sheets | 26.50 | 29.00 | 32.50 | 36.50 |
| Hot strip | 17.00 | 17.50 | 23.00 | 28.00 |
| Cold stp. | 22.00 | 22.50 | 28.50 | 36.50 |

## Steel Plate

| | |
|---|---|
| Pittsburgh | 2.10c |
| New York, del. | 2.29c |
| Philadelphia, del. | 2.15c |
| Boston, delivered | 2.42c |
| Buffalo, delivered | 2.33c |
| Chicago or Gary | 2.10c |
| Cleveland | 2.10c |
| Birmingham | 2.10c |
| Coatesville, base | 2.10c |
| Sparrows Point, base | 2.10c |
| Claymont, Del. | 2.10c |
| Youngstown | 2.10c |
| Gulf ports | 2.45c |
| Pacific Coast points | 2.60c |

**Steel Floor Plates**

| | |
|---|---|
| Chicago | 3.35c |
| Gulf ports | 3.70c |
| Pacific Coast ports | 3.95c |
| Pittsburgh | 3.35c |

## Standard Shapes

| | |
|---|---|
| Pittsburgh | 2.10c |
| Philadelphia, del. | 2.21½c |
| New York, del. | 2.27c |
| Boston, delivered | 2.41c |
| Bethlehem | 2.10c |
| Chicago | 2.10c |
| Cleveland, del. | 2.30c |
| Buffalo | 2.10c |
| Gulf ports | 2.45c |
| Birmingham | 2.10c |
| St. Louis, del. | 2.34c |
| Pacific Coast points | 2.70c |

## Tin and Terne Plate

| | |
|---|---|
| Tin plate, coke (base box) Pitts., Gary, Chgo. | $5.35 |
| Granite City | 5.45 |
| Mfg. terne plate, Pittsburgh, Gary, Chgo. | 4.65c |
| Granite City | 4.75c |

## Bars

**Soft Steel**

(Base, 3 to 25 tons)

| | |
|---|---|
| Pittsburgh | 2.25c |
| Chicago or Gary | 2.25c |
| Duluth | 2.35c |
| Birmingham | 2.25c |
| Cleveland | 2.25c |
| Buffalo | 2.25c |
| Detroit, delivered | 2.35c |
| Philadelphia, del. | 2.57c |
| Boston, delivered | 2.62c |
| New York, del. | 2.59c |
| Gulf ports | 2.60c |
| Pacific Coast points | 2.85c |

**Rail Steel**

To Manufacturing Trade

| | |
|---|---|
| Pittsburgh | 2.10c |
| Chicago or Gary | 2.10c |
| Detroit, delivered | 2.20c |
| Cleveland | 2.10c |

| | |
|---|---|
| Buffalo | 2.10c |
| Birmingham | 2.10c |
| Gulf ports | 2.45c |
| Pacific coast points | 2.70c |

**Iron**

| | |
|---|---|
| Terre Haute, Ind. | 2.15c |
| Chicago | 2.15c |
| Philadelphia | 2.47c |
| Pittsburgh, refined | 3.50-8.00c |

**Reinforcing**

New billet, straight lengths, quoted by distributors

| | |
|---|---|
| Pittsburgh | 2.05c |
| Chicago, Gary, Buffalo, Cleve., Birm., Young., Sparrows Pt. | 2.05c |
| Detroit, delivered | 2.15c |
| Gulf ports | 2.40c |
| Pacific coast ports, f.o.b. car docks | 2.50c |
| Philadelphia, del. | 2.22c |

Rail steel, straight lengths, quoted by distributors

| | |
|---|---|
| Pittsburgh, Gary, Chicago, Buffalo, Cleveland, Birmingham | 1.90c |
| Detroit, delivered | 2.00c |
| Gulf ports | 2.25c |
| Pacific Coast | 2.35c |

## Wire Products

Pitts.-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

| | |
|---|---|
| Standard wire nails | $2.45 |
| Cement coated nails | $2.45 |

(Per pound)

| | |
|---|---|
| Polished staples | 3.15c |
| Galv. fence staples | 3.40c |
| Barbed wire, galv. | 3.20c |
| Annealed fence wire | 2.95c |
| Galv. fence wire | 3.35c |
| Woven wire fencing (base C. L. column) | 67.00 |
| Single loop bale ties, (base C. L. column) | 56.00 |

**To Manufacturing Trade**

Base, Pitts.-Cleve.-Chicago-Birmingham (except spring wire)

| | |
|---|---|
| Bright bess., basic wire | 2.60c |
| Galvanized wire | 2.65c |
| Spring wire | 3.20c |

Worcester, Mass., $2 higher on bright basic and spring wire.

| | |
|---|---|
| Cut nails, C. L. Pitts. (10% disc. on all extras) | $3.60 |

## Cold-Finished Bars

| | Carbon | Alloy |
|---|---|---|
| Pittsburgh | 2.70c | 3.40c |
| Chicago | 2.70c | 3.40c |
| Gary, Ind. | 2.70c | 3.40c |
| Detroit | 2.75c | *3.50c |
| Cleveland | 2.70c | 3.40c |
| Buffalo | 2.70c | 3.40c |

*Delivered.

## Alloy Bars (Hot)

(*Base, 3 to 25 tons*)

| | |
|---|---|
| Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem | 2.80c |
| Detroit, delivered | 2.90c |

| Alloy | Diff. | Alloy | Diff. |
|---|---|---|---|
| S.A.E. | | S.A.E. | |
| 2000 | 0.35 | 3100 | 0.70 |
| 2100 | 0.75 | 3200 | 1.35 |
| 2300 | 1.55 | 3300 | 3.80 |
| 2500 | 2.25 | 3400 | 3.20 |
| 4100 0.15 to 0.25 Mo. | | | 0.55 |
| 4600 0.20 to 0.30 Mo. 1.50-2.00 Ni. | | | 1.10 |
| 5100 0.80-1.10 Cr. | | | 0.45 |
| 5100 Cr. spring flats | | | 0.15 |
| 6100 bars | | | 1.20 |
| 6100 spring flats | | | 0.85 |
| Cr. N., Van. | | | 1.50 |
| Carbon Van. | | | 0.85 |
| 9200 spring flats | | | 0.15 |
| 9200 spring rounds, squares | | | 0.40 |

Electric furnace up 50 cents.

## Piling

| | |
|---|---|
| Pittsburgh | 2.40c |
| Chicago, Buffalo | 2.40c |
| Gulf ports | 2.75c |

## Strip and Hoops

(Base, hot-rolled, 1 to 25 tons; cold-rolled, 3 to 25 tons)

| | |
|---|---|
| Hot strip to 23/8-in. Pittsburgh, Chicago, Gary, Cleveland Youngstown, Middletown Birmingham | 2.15c |
| Detroit, del. | 2.25c |
| Philadelphia, del. | 2.47c |
| New York, del. | 2.51c |
| Cooperage hoop, Pittsburgh, Chicago | 2.25c |
| Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown | 2.95c |
| Chicago | 3.05c |
| Detroit, del. | 3.05c |
| Worcester, Mass. | 3.15c |

| Carbon | Cleve. Pitts. |
|---|---|
| 0.26—0.50 | 2.95c |
| 0.51—0.75 | 4.30c |
| 0.76—1.00 | 6.15c |
| Over 1.00 | 8.35c |

Worcester, Mass., $4 higher.

**Commodity Cold-Rolled Strip**

| | |
|---|---|
| Pitts.-Cleve.-Youngstown | 3.10c |
| Detroit, del. | 3.20c |
| Worcester, Mass. | 3.50c |

Lamp stock up 10 cents.

## Rails, Fastenings

(Gross Tons)

| | |
|---|---|
| Standard rails, mill | $40.00 |
| Relay rails, Pittsburgh 20—100 lbs. | 32.50-35.50 |
| Light rails, billet qual., Pitts., Chicago, B'ham. | $40.00 |
| Do., rerolling quality | 39.00 |
| Angle bars, billet, mills | 2.70c |
| Do., axle steel | 2.35c |
| Spikes, R. R. base | 3.00c |
| Track bolts, base | 4.15c |
| Car axles forged, Pitts., Chgo., B'ham. | 3.15c |
| Tie plates, base | $43.00 |

Base, light rails 25 to 60 lbs.; 20 lbs. up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

## Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade as per Dec 1, 1932, lists, carloads 5% up; full containers additional 10%.

**Carriage and Machine**

| | |
|---|---|
| ½ x 6 and smaller | 65-5-5 off |
| Do. larger, to 1-in. | 60-10-5 off |
| Do. 1⅛ and larger | 60-5-5 off |
| Tire bolts | 50-5 off |

**Stove Bolts**

In packages with nuts attached 75 off; in packages with nuts separate 75-12½ off; bulk 85 off on 15,000 of 3-inch and shorter, or 5000 over 3-inch.

| | |
|---|---|
| Step bolts | 50-10-5-5 off |
| Elevator bolts | 50-10-5-5 off |
| Plow bolts | 65-5-5 off |

**Nuts**

| Semifinished hex. U.S.S. | S.A.E. |
|---|---|
| ¼-⅞-in., incl. | 65-10 70-5 |
| ½-⅞-in., incl. | 65-5 70 |
| ⅝-1-in., incl. | 60-10 65 |
| 1⅛ and larger | 60-5 60-5 |

**Hexagon Cap Screws**

| | |
|---|---|
| Milled | 50-10-5 off |
| Upset, 1-in. smaller | 67½-10 off |

**Square Head Set Screws**

| | |
|---|---|
| Upset, 1-in., smaller | 75-10 off |
| Headless set screws | 70-10 off |

## Rivets, Washers

| | |
|---|---|
| Structural, Pittsburgh, Cleveland | 3.40c |
| Structural, Chicago | 3.40c |

⅞-inch and smaller.

| | |
|---|---|
| Pitts., Chi., Cleve. | 65-10 off |
| Wrought washers, Pitts., Chi., Phila. to jobbers | |
| and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off | |
| Do., less carloads, 5 kegs or more, no discount on any extras | $3.90 |
| Do., under 5 kegs no disc. on any extras | $4.05 |

## Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less. Chicago, del. 2½ less. Wrought pipe, Pittsburgh.

**Butt Weld**

Steel

| In. | Blk | Galv. |
|---|---|---|
| ⅛ | 63½ | 54 |
| ¼ | 66½ | 58 |
| 1—3 | 68½ | 60½ |

Iron

| | | |
|---|---|---|
| ¼ | 30 | 13 |
| 1—1¼ | 34 | 19 |
| 1½ | 38 | 21½ |
| 2 | 37½ | 21 |

**Lap Weld**

Steel

| | | |
|---|---|---|
| 2 | 61 | 52½ |
| 2½—3 | 64 | 55½ |
| 3½—6 | 66 | 57½ |
| 7 and 8 | 65 | 55½ |
| 9 and 10 | 64½ | 55 |
| 11 and 12 | 63½ | 54 |

Iron

| | | |
|---|---|---|
| 2 | 30½ | 15 |
| 2½—3½ | 31½ | 17½ |
| 4 | 33½ | 21 |
| 4½—8 | 32½ | 20 |
| 9—12 | 28½ | 15 |

**Line Pipe**

Steel

| | |
|---|---|
| 1 to 3, butt weld | 67½ |
| 2, lap weld | 60 |
| 2½ to 3, lap weld | 63 |
| 3½ to 6, lap weld | 65 |
| 7 and 8, lap weld | 64 |
| 10-inch lap weld | 63½ |
| 12-inch, lap weld | 62½ |

Iron

| | Blk. | Galv |
|---|---|---|
| ¾ butt weld | 25 | 7 |
| 1 and 1¼ butt weld | 29 | 13 |
| 1½ butt weld | 33 | 15½ |
| 2 butt weld | 32½ | 15 |
| 1½ lap weld | 23½ | 7 |
| 2 lap weld | 25½ | 9 |
| 2½ to 3½ lap weld | 26½ | 11½ |
| 4 lap weld | 28½ | 15 |
| 4½ to 8 lap weld | 27½ | 14 |
| 9 to 12 lap weld | 23½ | 9 |

## Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut lengths 4 to 24 feet, f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

**Lap Welded**

| Sizes | Gage | Steel | Charcoal Iron |
|---|---|---|---|
| 1½" O. D. | 13 | $ 9.72 | $23.71 |
| 1¾" O. D. | 13 | 11.06 | 22.93 |
| 2" O. D. | 13 | 12.38 | 19.35 |
| 2¼" O. D. | 13 | 13.79 | 21.68 |
| 2¼" O. D. | 12 | 15.16 | ..... |
| 2½" O. D. | 12 | 16.58 | 26.57 |
| 2¾" O. D. | 12 | 17.54 | 29.00 |
| 3" O. D. | 12 | 18.35 | 31.36 |
| 3½" O. D. | 11 | 23.15 | 39.81 |
| 4" O. D. | 10 | 28.66 | 49.90 |
| 5" O. D. | 9 | 44.25 | 73.93 |
| 6" O. D. | 7 | 68.14 | ..... |

**Seamless**

| Sizes | Gage | Hot Rolled | Cold Drawn |
|---|---|---|---|
| 1" O. D. | 13 | $ 7.82 | $ 9.01 |
| 1¼" O. D. | 13 | 9.26 | 10.67 |
| 1½" O. D. | 13 | 10.23 | 11.79 |
| 1¾" O. D. | 13 | 11.64 | 13.42 |
| 2" O. D. | 13 | 13.04 | 15.03 |
| 2¼" O. D. | 13 | 14.54 | 16.76 |
| 2¼" O. D. | 12 | 16.01 | 18.45 |
| 2½" O. D. | 12 | 17.54 | 20.21 |
| 2¾" O. D. | 12 | 18.59 | 21.42 |
| 3" O. D. | 12 | 19.50 | 22.48 |
| 3½" O. D. | 11 | 24.62 | 28.37 |
| 4" O. D. | 10 | 30.54 | 35.20 |
| 4½" O. D. | 10 | 37.35 | 43.04 |
| 5" O. D. | 9 | 46.87 | 54.01 |
| 6" O. D. | 7 | 71.96 | 82.93 |

## Cast Iron Pipe

*Class B Pipe—Per Net Ton*

| | |
|---|---|
| 6-in., & over, Birm. | $42.00-43.00 |
| 4-in., Birmingham | 45.00-46.00 |
| 4-in., Chicago | 53.80-54.80 |
| 6-in. & over, Chicago | 50.80-51.80 |
| 6-in. & over, east fdy. | 46.00 |
| Do., 4-in. | 49.00 |

Class A Pipe $3 over Class B
Stnd. fitgs., Birm., base $100.00

## Semifinished Steel

**Rerolling Billets, Slabs**

(Gross Tons)

| | |
|---|---|
| Pittsburgh, Chicago, Gary, Cleve., Buffalo, Young., Birm., Sparrows Point | $34.00 |
| Duluth (billets) | 36.00 |
| Detroit, delivered | 36.00 |

**Forging Quality Billets**

*6 x 6 to 9 x 9-in., base*

| | |
|---|---|
| Pitts., Chicago, Buffalo | 40.00 |
| Duluth | 42.00 |

**Sheet Bars**

| | |
|---|---|
| Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago | 34.00 |
| Detroit, delivered | 36.00 |

**Wire Rods**

| | |
|---|---|
| Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅝-inch incl. | 43.00 |
| Do., over ⅝ to 11/4-in. incl. | 48.00 |

Worcester up $2; Galveston up $6; Pacific Coast up $9.

**Skelp**

| | |
|---|---|
| Pitts., Chi., Young., Buff., Coatesville, Sparrows Pt. | 1.90c |

## Coke

*Price Per Net Ton*

**Beehive Ovens**

| | |
|---|---|
| Connellsville, fur. | $3.75 |
| Connellsville, fdry. | 4.75- 5.50 |
| Connell. prem. fdry. | 5.75- 6.25 |
| New River fdry. | 6.50- 6.75 |
| Wise county fdry. | 5.50- 5.75 |
| Wise county fur. | 4.50- 4.75 |

**By-Product Foundry**

| | |
|---|---|
| Newark, N. J., del. | 10.88-11.35 |
| Chi., ov., outside del. | 9.75 |
| Chicago, del. | 10.50 |
| Milwaukee, ovens | 10.50 |
| New England, del. | 12.50 |
| St. Louis, del. | 11.00-11.50 |
| Birmingham, ovens | 7.00 |
| Indianapolis, del. | 10.00 |
| Cincinnati, del. | 9.75 |
| Cleveland, del. | 10.30 |
| Buffalo, del. | 10.50 |
| Detroit, del. | 10.25 |
| Philadelphia, del. | 10.65 |

## Coke By-Products

Spot, gal., freight allowed east of Omaha

| | |
|---|---|
| Pure and 90% benzol | 16.00c |
| Toluol, two degree | 22.00c |
| Solvent naphtha | 26.00c |
| Industrial xylol | 26.00c |

Per lb. f.o.b. Frankford and St. Louis

| | |
|---|---|
| Phenol (200 lb. drums) | 16 25c |
| Do. (450 lbs.) | 15.25c |

Eastern Plants, per lb.

| | |
|---|---|
| Naphthalene flakes, balls, bbls. to jobbers | 5.75c |
| Per ton, bulk, f.o.b. port | |
| Sulphate of ammonia | $27.25 |

# Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons.

| Basing Points: | No. 2 Fdry. | Malleable | Basic | Bessemer |
|---|---|---|---|---|
| Bethlehem, Pa. | $22.00 | $22.50 | $21.50 | $23.00 |
| Birdsboro, Pa. | 22.00 | 22.50 | 21.50 | 23.00 |
| Birmingham, Ala.‡ | 17.38 | ..... | 16.38 | 22.00 |
| Buffalo | 21.00 | 21.50 | 20.00 | 22.00 |
| Chicago | 21.00 | 21.00 | 20.50 | 21.50 |
| Cleveland | 21.00 | 21.00 | 20.50 | 21.50 |
| Detroit | 21.00 | 21.00 | 20.50 | 21.50 |
| Duluth | 21.50 | 21.50 | ..... | 22.00 |
| Erie, Pa. | 21.00 | 21.50 | 20.50 | 22.00 |
| Everett, Mass. | 22.75 | 23.25 | 22.25 | 23.75 |
| Granite City, Ill. | 21.00 | 21.00 | 20.50 | 21.50 |
| Hamilton, O. | 21.00 | 21.00 | 20.50 | ..... |
| Neville Island, Pa. | 21.00 | 21.00 | 20.50 | 21.50 |
| Provo, Utah | 19.00 | ..... | ..... | ..... |
| Sharpsville, Pa. | 21.00 | 21.00 | 20.50 | 21.50 |
| Sparrow's Point, Md. | 22.00 | ..... | 21.50 | ..... |
| Swedeland, Pa. | 22.00 | 22.50 | 21.50 | 23.00 |
| Toledo, O. | 21.00 | 21.00 | 20.50 | 21.50 |
| Youngstown, O. | 21.00 | 21.00 | 20.50 | 21.50 |

‡Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

| Delivered from Basing Points: | | | | |
|---|---|---|---|---|
| Akron, O., from Cleveland | 22.39 | 22.39 | 21.89 | 22.89 |
| Baltimore from Birmingham | 22.78 | ..... | 21.66 | ..... |
| Boston from Birmingham | 22.87 | ..... | ..... | ..... |
| Boston from Everett, Mass. | 23.25 | 23.75 | 22.75 | 24.25 |
| Boston from Buffalo | 23.25 | 23.75 | 22.75 | 24.25 |
| Brooklyn, N. Y., from Bethlehem | 24.50 | 25.00 | ..... | ..... |
| Canton, O., from Cleveland | 22.39 | 22.39 | 21.89 | 22.89 |
| Chicago from Birmingham | †21.22 | ..... | ..... | ..... |
| Cincinnati from Hamilton, O. | 21.44 | 22.11 | 21.61 | ..... |
| Cincinnati from Birmingham | 21.06 | ..... | 20.06 | ..... |
| Cleveland from Birmingham | 21.32 | ..... | 20.82 | ..... |
| Mansfield, O., from Toledo, O. | 22.94 | 22.94 | 22.44 | 22.44 |
| Milwaukee from Chicago | 22.10 | 22.10 | 21.60 | 22.60 |
| Muskegon, Mich., from Chicago, Toledo or Detroit | 24.19 | 24.19 | 23.69 | 24.69 |
| Newark, N. J., from Birmingham | 23.15 | ..... | ..... | ..... |
| Newark, N. J., from Bethlehem | 23.53 | 24.03 | ..... | ..... |
| Philadelphia from Birmingham | 22.46 | ..... | 21.96 | ..... |
| Philadelphia from Swedeland, Pa. | 22.84 | 23.34 | 22.34 | ..... |
| Pittsburgh district from Neville Island | Neville base, plus 69c, 84c, and $1.24 freight. | | | |
| Saginaw, Mich., from Detroit | 23.45 | 23.45 | 22.95 | 22.95 |

| | No. 2 Fdry. | Malleable | Basic | Bessemer |
|---|---|---|---|---|
| St. Louis, northern | 21.50 | 21.50 | 21.00 | ..... |
| St. Louis from Birmingham | †21.12 | ..... | 20.62 | ..... |
| St. Paul from Duluth | 23.63 | 23.63 | ..... | 24.13 |

†Over 0.70 phos.

**Low Phos.**

Basing Points: Birdsboro and Steelton, Pa., and Standish, N. Y., $26.50, Phil, base, standard and copper bearing, $27.63.

| Gray Forge | | Charcoal | |
|---|---|---|---|
| Valley furnace | $20.50 | Lake Superior fur. | $25.00 |
| Pitts. dist. fur. | 20.50 | do., del. Chicago | 28.34 |
| | | Lyles, Tenn. | 23.50 |

**Silvery†**

Jackson count, O., base: 6-6.50 per cent $25.50; 6.51-7—$26.00; 7-7.50—$26.50; 7.51-8—$27.00; 8-8.50—$27.50; 8.51-9—$28.00; 9-9.50—$28.50; Buffalo $1.25 higher.

**Bessemer Ferrosilicon†**

Jackson county, O., base: Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

# Refractories

**Per 1000 f.o.b. Works, Net Prices**

**Fire Clay Brick**

*Super Quality*

| | |
|---|---|
| Pa., Mo., Ky. | $60.80 |

*First Quality*

| | |
|---|---|
| Pa., Ill., Md., Mo., Ky. | 47.50 |
| Alabama, Georgia | 47.50 |
| New Jersey | 52.50 |

*Second Quality*

| | |
|---|---|
| Pa., Ill., Ky., Md., Mo. | 42.75 |
| Georgia, Alabama | 34.20 |
| New Jersey | 49.00 |

*Ohio*

| | |
|---|---|
| First quality | 39.90 |
| Intermediate | 36.10 |
| Second quality | 31.35 |

**Malleable Bung Brick**

| | |
|---|---|
| All bases | $56.05 |

**Silica Brick**

| | |
|---|---|
| Pennsylvania | $47.50 |
| Joliet, E. Chicago | 56.05 |
| Birmingham, Ala. | 47.50 |

**Ladle Brick**

(Pa., O., W. Va., Mo.)

| | |
|---|---|
| Dry press | $28.00 |
| Wire cut | $26.00 |

**Magnesite**

| | |
|---|---|
| Imported dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags) | $45.00 |
| Do. domestic | 40.00 |
| Do., f.o.b. Chewelah, Wash., net ton, bulk | 22.00 |
| net ton, bags | 26.00 |
| Quickset magnesite grains, f.o.b. Chewelah, Wash., net ton, bulk | 22.00 |

**Basic Brick**

*Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.*

| | |
|---|---|
| Chrome brick | $47.00 |
| Chem. bonded chrome | 47.00 |
| Magnesite brick | 67.00 |
| Chem. bonded magnesite | 57.00 |

# Fluorspar, 85-5

| | |
|---|---|
| Washed gravel, duty paid, tide, net ton | $23.50-24.00 |
| Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail $20, barge | $22.00 |
| No. 2 lump | 22.00-23.00 |

# Ferroalloy Prices

**Ferromanganese,** 78-82%, tidewater, duty pd. $92.50; Do., del. Pittsburgh 97.77

**Spiegeleisen,** 19-21% dom. Palmerton, Pa., spot 28.00; Do., New Orleans 28.00; Do., 26-28%, Palmerton 33.00

**Ferrosilicon,** 50% freight allowed, c.l. 69.50; Do., ton lot 80.50; Do., 75 per cent 126.00; Spot, $5 a ton higher.

**Silicoman.,** 2½ carbon 97.75; 2% carbon 102.75 1%, 112.75 Contract ton price $11 higher; spot $5 over contract.

**Ferrotungsten,** stand., lb. con. del. cars 1.60-1.65

**Ferrovanadium,** 35 to 40%, lb., cont. 2.70-2.80

**Ferrophosphorus,** per ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

**Ferrochrome,** 66-70 chromium, 4-6 carbon, cts. lb. del. carlots 10.50c; Do., ton lots 11.25c; Do., less-ton lots 11.50c

67-72% carloads, 2% carbon, per lb. contained chrome 16.50c; Do., ton lots 17.25c; Do., less-ton lots 17.50c

| | Carloads | Ton lots | Less ton |
|---|---|---|---|
| 2% carb. | 16.50c | 17.25c | 17.50c |
| 1% carb. | 17.50c | 18.25c | 18.50c |
| 0.10% carb. | 18.50c | 19.25c | 19.50c |
| 0.20% carb. | 19.50c | 20.25c | 20.50c |

Spot ¼c higher

**Ferromolybdenum,** 55-65% molyb. cont., f.o.b. mill, lb. 0.95

**Calcium molybdate,** lb. molyb. cont., f.o.b. mill 0.80

**Ferrotitanium,** 40%, lb. con. ti., ton lots 1.23; Do, less-ton lots 1.25; 20-25% carbon, 0.10 max., ton lots, lb. 1.35; Do, less-ton lots 1.40

Spot 5c higher

**Ferrocolumbium,** 50-55%, contract, lb. con. col., f.o.b. Niagara Falls 2.25; Do, less-ton lots 2.30

Spot is 10c higher

**Technical molybdenum trioxide,** 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

**Ferro-carbon-titanium,** 15-18%, ti., 6-8% carb., carlots, contr., net ton 142.50; Do, spot 145.00; Do, contract, ton lots 145.00; Do, spot, ton lots 150.00

15-18% ti., 3-5% carbon, carlots, contr., net ton 157.50; Do, spot 160.00; Do. contract, ton lots 160.00; Do, spot, ton lots 165.00

**Alsifer,** contract carlots, f.o.b. Niagara Falls, lb. 7.50c; Do, ton lots 8.00c; Do, less-ton lots 8.50c

Spot ½c lb. higher

**Chromium Briquets,** contract carloads, freight allowed, lb. 7.25c; Do, spot carlots, bulk 7.50c; Do, ton lots 8.00c; Do, less-ton lots 8.50c

**Tungsten Metal Powder,** according to grade, spot shipment, 200-lb. drum lots, lb. $2.05; Do, smaller lots 2.15

**Vanadium Pentoxide,** contract, lb. contained 1.10; Do, spot 1.15

**Chromium Metal,** 98% cr., 0.50 carbon max., contract, lb. con. chrome 80.00c; Do, spot 85.00c; 88% chrome, contract 79.00c; Do, spot 84.00c

**Silicon Metal,** 1% iron, contract, lb. 14.50c; Do, 2% 13.00c

Spot ¼c higher

**Silicon Briquets,** contract, carloads, freight allowed, ton $69.50; Carload, spot 74.50; Less-ton lots, lb. 3.75c

**Manganese Briquets,** contract carloads, freight allowed lb. 4.75c; Ton lots 5.25c; Less-ton lots 5.50c

Spot ¼c higher

**Zirconium Alloy,** 12-15%, carloads, gross ton $97.50; Do, spot 102.50

34-40%, contract, carloads, lb., alloy 14.00c; Do, ton lots 15.00c; Do, less-ton lots 16.00c

Spot ¼c higher

**Molybdenum Powder,** 99%, f.o.b. York, Pa., 200-lb. kegs, lb. $2.60; Do, 100-200 lb. lots 2.75; Do, under 100-lb. lots 3.00

# WAREHOUSE STEEL PRICES

*Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials*

| | Soft Bars | Bands | Hoops | Plates ¼-in. & Over | Structural Shapes | Floor Plates | Sheets: Hot Rolled | Sheets: Cold Rolled | Sheets: Galv. No. 24 |
|---|---|---|---|---|---|---|---|---|---|
| Boston | 3.98 | 4.21 | 5.21 | 3.85 | 3.85 | 5.66 | 3.86 | 4.93 | 4.76 |
| New York (Metropolitan) | 3.94 | 4.11 | 4.11 | 3.76 | 3.75 | 5.56 | 3.73 | 4.90 | 4.40 |
| Philadelphia | 3.60 | 3.60 | 4.10 | 3.40 | 3.40 | 5.00 | 3.40 | .... | 4.50 |
| Baltimore | 3.80 | 3.95 | 4.35 | 3.65 | 3.65 | 5.00 | 3.70 | 5.05 | 4.30 |
| Norfolk, Va. | 4.00 | 4.15 | 4.55 | 3.85 | 3.85 | 5.20 | 3.90 | 4.80 | 5.40 |
| Buffalo | 3.60 | 3.97 | 3.97 | 3.77 | 3.55 | 5.40 | 3.50 | 4.55 | 4.40 |
| Pittsburgh | 3.60 | 3.75 | 3.75 | 3.55 | 3.55 | 5.15 | 3.50 | 4.60 | 4.50 |
| Cleveland | 3.50 | 3.65 | 3.65 | 3.55 | 3.73 | 5.33 | 3.50 | 4.70 | 4.62 |
| Detroit | 3.68 | 3.83 | 3.83 | 3.75 | 3.80 | 5.42 | 3.58 | 4.65 | 4.74 |
| Cincinnati | 3.85 | 3.82 | 3.82 | 3.80 | 3.83 | 5.43 | 3.57 | .... | 4.57 |
| Chicago | 3.60 | 3.75 | 3.75 | 3.55 | 3.55 | 5.15 | 3.50 | 4.45 | 4.50 |
| Minneapolis | 3.85 | 4.00 | 4.00 | 3.80 | 3.80 | 5.40 | 3.75 | 5.10 | 4.75 |
| Milwaukee | 3.73 | 3.88 | 3.88 | 3.68 | 3.68 | 5.28 | 3.63 | 4.58 | 4.63 |
| St. Louis | 3.87 | 4.02 | 4.02 | 3.82 | 3.82 | 5.42 | 3.77 | 4.72 | 4.77 |
| Kansas City | 4.15 | 4.30 | 4.30 | 4.10 | 4.10 | 5.70 | 4.10 | .... | 4.75 |
| Memphis | 4.01 | 4.16 | 4.16 | 3.96 | 3.96 | 5.71 | 3.91 | .... | 5.26 |
| Chattanooga | 3.90 | 4.05 | 4.05 | 3.85 | 3.85 | 5.80 | 3.80 | .... | 4.40 |
| Tulsa, Okla. | 4.64 | 4.79 | 4.79 | 4.59 | 4.59 | 6.19 | 4.54 | .... | 5.54 |
| Birmingham, Ala. | 3.50 | 3.65 | 3.65 | 3.45 | 3.45 | 5.83 | 3.40 | .... | 4.75 |
| New Orleans | 4.10 | 4.65 | 4.65 | 4.00 | 4.00 | 5.95 | 4.25 | .... | 5.15 |
| Houston, Tex. | 3.50 | 5.85 | 6.25 | 4.05 | 4.05 | 5.65 | 4.20 | .... | 5.25 |
| Seattle | 4.30 | 4.50 | 5.85 | 4.05 | 4.15 | 5.90 | 4.20 | .... | 5.50 |
| Portland, Oreg. | 4.30 | 4.70 | 6.10 | 4.15 | 4.15 | 5.90 | 3.75 | 6.50 | 4.75 |
| Los Angeles | 4.00 | 4.50 | 6.35 | 4.00 | 4.00 | 6.20 | 4.20 | 6.30 | 5.05 |
| San Francisco | 4.05 | 4.45 | 6.00 | 3.85 | 3.95 | 5.45 | 4.00 | 6.40 | 5.15 |

| | Cold Rolled Strip | Cold Finished Bars | SAE Hot-rolled Bars (Unannealed): 1035-1050 | 2300 Series | 3100 Series | 4100 Series | 6100 Series | SAE Cold Drawn Bars: 2300 | 3100 |
|---|---|---|---|---|---|---|---|---|---|
| Boston | 3.61 | 4.43 | 4.28 | 7.65 | 6.25 | 6.00 | 8.05 | 8.73 | 7.38 |
| New York | 3.66 | 4.39 | 4.14 | 7.50 | 6.10 | 5.85 | .... | 8.69 | 7.29 |
| Philadelphia | 3.66 | 4.36 | 3.85 | 7.46 | 6.06 | 5.81 | 8.71 | .... | .... |
| Baltimore | .... | 4.35 | 3.95 | .... | .... | .. | .... | .... | .. |
| Norfolk, Va. | .... | 4.60 | .... | .... | .... | .... | .... | .... | .... |
| Buffalo | 3.57 | 4.05 | 3.80 | 7.25 | 5.85 | 5.60 | 7.65 | 8.25 | 6.85 |
| Pittsburgh | 3.35 | 3.95 | 3.80 | 7.35 | 5.95 | 5.70 | 7.75 | 8.35 | 6.95 |
| Cleveland | 3.35 | 4.05 | 3.70 | 7.45 | 6.05 | 6.05 | 7.85 | 8.25 | 6.85 |
| Detroit | 3.55 | 4.10 | 3.83 | 7.57 | 6.17 | 5.92 | 7.39 | 8.55 | 7.15 |
| Cincinnati | 3.60 | 4.30 | 3.90 | 7.59 | 6.19 | 5.94 | 8.99 | 8.60 | 7.20 |
| Chicago | 3.65 | 4.05 | 3.80 | 7.25 | 5.85 | 5.60 | 7.65 | 8.25 | 6.85 |
| Minneapolis | .... | 4.64 | 4.00 | 7.60 | 6.20 | 8.79 | 9.34 | 8.94 | 7.54 |
| Milwaukee | .... | 4.18 | 3.93 | 7.48 | 6.08 | 5.83 | 7.88 | 8.48 | 7.08 |
| St. Louis | 3.76 | 4.32 | 4.07 | 7.62 | 6.22 | 5.97 | 8.02 | 8.62 | 7.22 |
| Kansas City | 4.46 | 4.60 | .... | .... | .... | .... | .... | .... | .... |
| Memphis | .... | 4.61 | .... | .... | .... | .... | .... | .... | .... |
| Chattanooga | .... | 4.90 | .... | .... | .... | .... | .... | .... | .... |
| Tulsa, Okla. | .... | 5.09 | .... | .... | .... | .... | .... | .... | .... |
| Birmingham, Ala. | .. | 4.73 | .... | .... | .... | .... | .... | .... | .... |
| New Orleans | 5.00 | 5.10 | .... | .... | .... | .... | .... | .... | .... |
| Seattle | .... | 5.60 | 5.65 | .... | 7.80 | 7.65 | 8.45 | .... | .... |
| Portland, Oreg. | .... | 5.60 | 6.10 | 9.00 | 8.00 | 7.85 | 8.70 | .. | |
| Los Angeles | 4.45 | 6.60 | 4.65 | 9.40 | 8.55 | 8.40 | 9.05 | 10.40 | 9.55 |
| San Francisco | *9.30 | 6.55 | 5.20 | 9.65 | 8.80 | 8.65 | 9.30 | 10.65 | 9.80 |

*Based on minimum quantity.

# CURRENT IRON AND STEEL PRICES OF EUROPE

**Dollars at Rates of Exchange, Oct. 6**

## Export Prices f. o. b. Port of Dispatch—

*By Cable or Radio*

| | British gross tons U. K. ports £ s d | Continental Channel or North Sea ports, gross tons: Quoted in dollars at current value | **Quoted in gold pounds sterling £ s d |
|---|---|---|---|
| Foundry, 2.50-3.00 Si. | $26.45 5 10 0 | $16.15 | 1 19 0 |
| Basic bessemer | ..... ..... | 18.42 | 2 4 6 |
| Hematite, Phos. .03-.05 | 31.26 6 10 0* | ..... | ..... |
| Billets | $37.88 7 17 6 | $35.19 | 4 5 0 |
| Wire rods, No. 5 gage | 54.23 11 5 6 | 42.44 | 5 2 6 |
| Standard rails | $48.70 10 2 6 | $47.61 | 5 15 0 |
| Merchant bars | 2.37c 11 0 0 | 1.92c to 1.97c | 5 2 6 to 5 5 0 |
| Structural shapes | 2.28c 10 12 6 | 1.83c | 4 17 6 |
| Plates, †¼ in. or 5 mm. | 2.49c 11 11 3 | 2.11c to 2.30c | 5 12 6 to 6 2 6 |
| Sheets, black, 24 gage or 0.5 mm. | 2.80c 13 0 0 | 2.72c | 7 5 0° |
| Sheets, gal., 24 ga., corr. | 3.39c 15 15 0 | 3.28c | 8 15 0 |
| Bands and strips | 2.85c 13 5 0 | 2.16c | 5 15 0 |
| Plain wire, base | 4.19c 19 10 0 | 2.30c to 2.72c | 6 2 6 to 7 5 0 |
| Galvanized wire, base | 5.00c 23 5 0 | 2.94c to 3.04c | 7 17 6 to 8 2 6 |
| Wire nails, base | 3.98c 18 10 0 | 2.62c to 2.81c | 7 0 0 to 7 10 0 |
| Tin plate, box 108 lbs. | $ 4.87 1 0 3 | ..... | ..... |

British ferromanganese $92.50 delivered Atlantic seaboard duty-paid.

## Domestic Prices at Works or Furnace—

*Last Reported*

| | £ s d | French Francs | | Belgian Francs | | Reich Mark |
|---|---|---|---|---|---|---|
| Fdy. pig iron, Si. 2.5 | $26.21 5 9 0(a) | $16.03 | 598 | $15.55 | 460 | $25.24 63 |
| Basic bess. pig iron | 24.05 5 0 0 | ..... | ... | ..... | ... | 27.84 (b) 69.50 |
| Furnace coke | 6.61 1 7 6 | 5.49 | 205 | 7.29 | 215 | 7.61 19 |
| Billets | 37.88 7 17 6 | 22.51 | 840 | 29.15 | 860 | 38.66 96.50 |
| Standard rails | 2.18c 10 2 6 | 1.38c | 1,150 | 2.06c | 1,375 | 2.38c 132 |
| Merchant bars | 2.62c 12 4 0†† | 1.30c | 1,080 | 1.65c | 1,100 | 1.98c 110 |
| Structural shapes | 2.37c 11 0 6†† | 1.27c | 1,055 | 1.65c | 1,100 | 1.93c 107 |
| Plates, †¼-in. or 5 mm. | 2.52c 11 14 3†† | 1.62c | 1,350 | 2.06c | 1,375 | 2.29c 127 |
| Sheets, black | 3.39c 15 15 0§ | 1.92c | 1,600‡ | 2.36c | 1,575‡ | 2.59c 144‡ |
| Sheets, galv., corr., 24 ga. or 0.5 mm | 3.98c 18 10 0 | 2.70c | 2,250 | 4.13c | 2,750 | 6.66c 370 |
| Plain wire | 4.19c 19 10 0 | 1.98c | 1,650 | 2.48c | 1,650 | 3.11c 173 |
| Bands and strips | 2.78c 12 19 0†† | 1.45c | 1,210 | 1.95c | 1,300 | 2.29c 127 |

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open hearth steel. Continent usually for basic-bessemer steel. (a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. °Close annealed ††Rebate of 15s on certain conditions.

**Gold pound sterling carries a premium of 70 per cent over paper sterling.

*—The Market Week—*

# IRON AND STEEL SCRAP PRICES

***Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; † indicates brokers prices***

**HEAVY MELTING STEEL**

| | |
|---|---|
| Birmingham, No. 1. | †11.00 |
| Bos. dock No. 1 exp. | 13.00-13.25 |
| New Eng. del. No. 1 | 13.00 |
| Buffalo, No. 1 | 14.00-14.50 |
| Buffalo, No. 2 | 12.00-12.50 |
| Chicago, No. 1 | 12.50-13.00 |
| Chicago, auto, no alloy | 11.00-11.50 |
| Chicago, No. 2 auto | 10.00-10.50 |
| Cincinnati, dealers | 11.25-11.75 |
| Cleveland, No. 1 | 12.50-13.00 |
| Cleveland, No. 2 | 11.00-11.50 |
| Detroit, No. 1 | 9.75-10.25 |
| Detroit (industrial) | 11.00-11.50 |
| Eastern Pa., No. 1 | 14.50-15.00 |
| Eastern Pa., No. 2 | 13.00-13.50 |
| Federal, Ill. | 12.00-12.50 |
| Granite City, R. R. | 12.50-13.00 |
| Granite City, No. 2 | 12.00-12.50 |
| Los Angeles, No. 1 | 11.50-12.00 |
| Los Angeles, No. 2 | 10.00-10.50 |
| N.Y. dock No. 1 exp. | 11.50-12.00 |
| Pitts., No. 1 (R. R.) | 15.75-16.25 |
| Pittsburgh, No. 1 | 14.75-15.25 |
| Pittsburgh, No. 2 | 13.50-14.00 |
| St. Louis, R. R. | 12.00-12.50 |
| St. Louis, No. 2 | 11.50-12.00 |
| San Francisco, No. 1 | 12.00 |
| Seattle, No. 1 | 10.00-12.00 |
| Toronto, dirs. No. 1 | 10.00-10.50 |
| Valleys, No. 1 | 13.50-14.00 |

**COMPRESSED SHEETS**

| | |
|---|---|
| Buffalo | 12.00-12.50 |
| Chicago, factory | 11.75-12.25 |
| Chicago, dealer | 10.25-10.75 |
| Cincinnati, del. | 10.00-10.50 |
| Cleveland | 12.00-12.50 |
| Detroit | 11.50-12.00 |
| E. Pa., new mat. | 14.50-15.00 |
| E. Pa., old mat. | 10.00-10.50 |
| Los Angeles | 12.50-13.00 |
| Pittsburgh | 14.75-15.25 |
| St. Louis | 10.00-10.50 |
| Valleys | 13.00-13.50 |

**BUNDLED SHEETS**

| | |
|---|---|
| Buffalo, No. 1 | 12.00-12.50 |
| Buffalo, No. 2 | 11.00-11.50 |
| Cleveland | 10.00-10.50 |
| Los Angeles | 11.00-11.50 |
| Pittsburgh | 13.50-14.00 |
| St. Louis | 7.50- 8.00 |
| Toronto, dealers | 4.00 |

**SHEET CLIPPINGS, LOOSE**

| | |
|---|---|
| Chicago | 8.50- 9.00 |
| Cincinnati, dealers | 6.00- 6.50 |
| Detroit | 8.50- 9.00 |
| †Los Angeles | 3.75- 4.00 |
| St. Louis | 7.00- 7.50 |

**BUSHELING**

| | |
|---|---|
| Buffalo, No. 1 | 12.00-12.50 |
| Chicago, No. 1 | 11.50-12.00 |
| Cincin., No. 1, deal. | 6.50- 7.00 |
| Cincinnati, No. 2 | 2.75- 3.25 |
| Cleveland, No. 2 | 7.25- 7.75 |
| Detroit, No. 1, new | 10.50-11.00 |
| Valleys, new, No. 1 | 13.00-13.50 |
| Toronto, dealers | 4.00 |

**MACHINE TURNINGS (Long)**

| | |
|---|---|
| Birmingham | †4.50- 5.00 |
| Buffalo | 6.50- 7.00 |
| Chicago | 6.50- 7.00 |
| Cincinnati, dealers | 3.75- 4.25 |
| Cleveland | 7.00- 7.50 |
| Detroit | 5.50- 6.00 |
| Eastern Pa. | 8.50- 9.00 |
| Los Angeles | 4.00- 4.25 |
| New York | †3.50- 4.00 |
| Pittsburgh | 9.50-10.00 |
| St. Louis | 4.00- 4.50 |
| Toronto, dealers | 4.25- 4.75 |
| Valleys | 8.50- 9.00 |

**SHOVELING TURNINGS**

| | |
|---|---|
| Buffalo | 8.00- 8.50 |
| Cleveland | 7.50- 8.00 |
| Chicago | 7.00- 7.50 |
| Detroit | 6.50- 7.00 |
| Pittsburgh | 10.50-11.00 |

**BORINGS AND TURNINGS**

*For Blast Furnace Use*

| | |
|---|---|
| Boston district | 2.00 |
| Buffalo | 7.00- 7.50 |
| Cincinnati, dealers | 3.25- 3.75 |
| Cleveland | 7.50- 8.00 |
| Eastern Pa. | 6.00- 6.50 |
| Detroit | 5.50- 6.00 |
| New York | †2.50- 3.00 |
| Pittsburgh | 8.50- 9.00 |
| Toronto, dealers | 3.50 |

**AXLE TURNINGS**

| | |
|---|---|
| Boston district | †7.50 |
| Buffalo | 9.50-10.00 |
| Chicago, elec. fur. | 10.75-11.25 |
| Eastern Pa. | 10.50-11.00 |
| St. Louis | 9.00- 9.50 |
| Toronto | 5.00 |

**CAST IRON BORINGS**

| | |
|---|---|
| Birmingham | †6.00- 6.50 |
| Boston dist. chem. | †5.00- 5.25 |
| Buffalo | 7.00- 7.50 |
| Chicago | 5.50- 6.00 |
| Cincinnati, dealers | 3.25- 3.75 |
| Cleveland | 7.25- 7.75 |
| Detroit | 5.50- 6.00 |
| E. Pa., chemical | 10.00-11.00 |
| New York | †3.50- 4.00 |
| St. Louis | 3.00- 3.50 |
| Toronto, dealers | 3.50 |

**RAILROAD SPECIALTIES**

| | |
|---|---|
| Chicago | 15.50-16.00 |

**ANGLE BARS—STEEL**

| | |
|---|---|
| Chicago | 14.00-14.50 |
| St. Louis | 14.00-14.50 |

**SPRINGS**

| | |
|---|---|
| Buffalo | 16.00-16.50 |
| Chicago, coil | 15.75-16.25 |
| Chicago, leaf | 14.50-15.00 |
| Eastern Pa. | 16.50-17.00 |
| Pittsburgh | 16.50-17.00 |
| St. Louis | 15.00-15.50 |

**STEEL RAILS, SHORT**

| | |
|---|---|
| Birmingham | †12.00-12.50 |
| Buffalo | 17.00-17.50 |
| Chicago (3 ft.) | 15.25-15.75 |
| Chicago (2 ft.) | 15.75-16.25 |
| Cincinnati, dealers | 16.00-16.50 |
| Detroit | 16.50-17.00 |
| Los Angeles | 15.00-17.50 |
| Pitts., 3 ft. and less | 16.75-17.25 |
| St. Louis, 2 ft. & less | 15.00-15.50 |

**STEEL RAILS, SCRAP**

| | |
|---|---|
| Boston district | †13.50-14.00 |
| Buffalo | 16.00-16.50 |
| Chicago | 13.00-13.50 |
| Cleveland | 17.00-17.50 |
| Pittsburgh | 16.00-16.50 |
| St. Louis | 13.50-14.00 |
| Seattle | 16.00 |

**FROGS, SWITCHES**

| | |
|---|---|
| Chicago | 13.00-13.50 |
| St. Louis, cut | 13.50-14.00 |

**ARCH BARS, TRANSOMS**

| | |
|---|---|
| St. Louis | 15.00-15.50 |

**PIPE AND FLUES**

| | |
|---|---|
| Cincinnati, dealers | 6.00- 6.50 |
| Chicago, net | 8.00- 8.50 |

**RAILROAD GRATE BARS**

| | |
|---|---|
| Buffalo | 10.00-10.50 |
| Chicago, net | 7.00- 7.50 |
| Cincinnati, dealers | 6.75- 7.25 |
| Eastern Pa. | 13.50 |
| New York | †8.50- 9.00 |
| St. Louis | 8.50- 9.00 |

**RAILROAD WROUGHT**

| | |
|---|---|
| Birmingham | †11.00-11.50 |
| Boston district | †9.50-10.00 |
| Chicago, No. 1 net | 8.50- 9.00 |
| Eastern Pa., No. 1 | 15.00-15.50 |
| St. Louis, No. 1 | 10.75-11.25 |
| St. Louis, No. 2 | 12.00-12.50 |
| Toronto, No. 1 dlr. | 10.00 |

**FORGE FLASHINGS**

| | |
|---|---|
| Boston district | †7.25-7.75 |
| Buffalo | 12.00-12.50 |
| Cleveland | 11.50-12.00 |
| Detroit | 9.00- 9.50 |
| Los Angeles | 9.00 |
| Pittsburgh | 13.00-13.50 |

**FORGE SCRAP**

| | |
|---|---|
| Boston district | †6.50 |
| Chicago, heavy | 15.00-15.50 |

**LOW PHOSPHORUS**

| | |
|---|---|
| Buffalo, crops | 16.50-17.00 |
| Cleveland, crops | 18.00-18.50 |
| Eastern Pa., crops | 16.50-17.00 |
| Pittsburgh, crops | 17.00-17.50 |

**LOW PHOS. PUNCHINGS**

| | |
|---|---|
| Buffalo | 15.50-16.00 |
| Chicago | 15.50-16.00 |
| Eastern Pa. | 17.00-17.50 |
| Pitts. (light & hvy.) | 15.50-16.00 |
| Seattle | 15.00 |

**RAILS FOR ROLLING**

*5 feet and over*

| | |
|---|---|
| Birmingham | †14.00-15.00 |
| Boston | 15.00-15.50 |
| Chicago | 16.00-16.50 |
| New York | †15.00-15.50 |
| Eastern Pa. | 17.00-17.50 |
| St. Louis | 16.50-17.00 |

**STEEL CAR AXLES**

| | |
|---|---|
| Birmingham | †15.00-16.00 |
| Buffalo | 16.50-17.00 |
| Boston district | †16.00 |
| Chicago, net | 18.50-19.00 |
| Eastern Pa. | 21.50-22.50 |
| St. Louis | 18.50-19.00 |

**LOCOMOTIVE TIRES**

| | |
|---|---|
| Chicago (cut) | 14.50-15.00 |
| St. Louis, No. 1 | 14.00-14.50 |

**SHAFTING**

| | |
|---|---|
| Boston district | †14.25 |
| New York | †15.00-15.50 |
| Eastern Pa. | 19.50-20.00 |
| St. Louis, 1¼-3¾" | 17.00-17.50 |

**CAR WHEELS**

| | |
|---|---|
| Birmingham | †13.50-14.00 |
| Boston dist., iron | †11.00 |
| Buffalo, steel | 16.50-17.00 |
| Chicago, iron | 12.50-13.00 |
| Chicago, rolled steel | 14.50-15.00 |
| Cincin., iron, deal. | 13.25-13.75 |
| Eastern Pa., iron | 16.50-17.00 |
| Eastern Pa., steel | 16.50-17.00 |
| Pittsburgh, iron | 15.00-15.50 |
| Pittsburgh, steel | 16.50-17.00 |
| St. Louis, iron | 13.75-14.25 |
| St. Louis, steel | 15.00-15.50 |

**NO. 1 CAST SCRAP**

| | |
|---|---|
| Birmingham | †12.50-13.00 |
| Boston, No. 1 mach. | †11.00-11.50 |
| N. Eng. del. No. 2 | 11.00-11.50 |
| N. Eng. del. textile | 12.50-13.00 |
| Buffalo, cupola | 14.50-15.00 |
| Buffalo, mach. | 15.50-16.00 |
| Chicago, agri. net | 10.75-11.25 |
| Chicago, auto net | 11.50-12.00 |
| Chicago, railr'd net | 11.00-11.50 |
| Chicago, mach. net | 11.75-12.25 |
| Cincin., mach. deal. | 11.75-12.25 |
| Cleveland, mach. net | 16.75-17.25 |
| Eastern Pa., cupola | 16.50-17.00 |
| E. Pa., mixed yard | 14.00-14.50 |
| Los Angeles, net | 13.50-14.00 |
| Pittsburgh, cupola | 15.00-15.50 |
| San Francisco, del. | 13.50-14.00 |
| Seattle | 10.00-12.00 |
| St. Louis, cupola | 12.00-12.50 |
| St. L., No. 1, mach. | 14.00-14.50 |
| St. Louis, agr. mach. | 12.75-13.25 |
| Toronto, No. 1, mach., net | 11.00-12.00 |

**HEAVY CAST**

| | |
|---|---|
| Boston dist. break. | †10.25-10.75 |
| New England, del. | †12.50-13.00 |
| Buffalo, break. | 11.00-11.50 |
| Cleveland, break. net | 13.00-13.50 |
| Detroit, auto net | 11.50-12.00 |
| Detroit, break. | 9.50-10.00 |
| Eastern Pa. | 16.00-16.50 |
| Los Ang., auto, net | 13.00-13.50 |
| New York, break. | †11.00-11.50 |
| Pittsburgh, break. | 13.00-13.50 |

**STOVE PLATE**

| | |
|---|---|
| Birmingham | †7.50- 8.00 |
| Boston district | †8.00- 8.25 |
| Buffalo | 13.00-13.50 |
| Chicago, net | 7.50- 8.00 |
| Cincinnati, dealers | 6.75- 7.25 |
| Detroit, net | 8.50- 9.00 |
| Eastern Pa. | 13.50 |
| New York, fdy. | †10.00-10.50 |
| St. Louis | 10.00-10.50 |
| Toronto, dealers, net | 7.50- 8.00 |

**MALLEABLE**

| | |
|---|---|
| Birmingham, R. R. | †10.50-11.00 |
| New England, del. | 14.50-15.00 |
| Buffalo | 13.50-14.00 |
| Chicago, R. R. | 13.50-14.00 |
| Cincin., agri. deal. | 11.25-11.75 |
| Cleveland, rail | 15.00-15.50 |
| Eastern Pa., R. R. | 15.50-16.00 |
| Los Angeles | 17.50-18.00 |
| Pittsburgh, rail | 14.50-15.00 |
| St. Louis, R. R. | 12.00-12.50 |

## Iron Ore

**Lake Superior Ore**

*Gross ton, 51½ % Lower Lake Ports*

| | |
|---|---|
| Old range bessemer | $5.25 |
| Mesabi nonbess. | 4.95 |
| High phosphorus | 4.85 |
| Mesabi bessemer | 5.10 |
| Old range nonbess. | 5.10 |

**Eastern Local Ore**

*Cents, unit, del. E. Pa.*

| | |
|---|---|
| Foundry and basic 56.63% con. | 9.00-10.00 |
| Cop.-free low phos. 58-60% | nominal |

**Foreign Ore**

*Cents per unit, c.i.f. Atlantic*

| | |
|---|---|
| Foreign manganiferous ore, 45.55% iron, 6-10% man. nom. | 12.00 |
| No. Afr. low phos. | 13.00 |
| Swedish low phos. | 13.00 |
| Spanish No. Africa basic, 50 to 60% nom. | 12.00 |
| Tungsten, sh. ton unit, duty pd. nom. | $21.00 |
| N. F., fdy., 55% | 7.00 |
| Chrome ore, 48% gross ton, c.i.f. | $24.50-25.50 |
| Molybdenum ores sulphide, per lb. molybdenum contained, f.o.b. mill | 0.75 |

## Manganese Ore

Prices not including duty, cents per unit cargo lots.

| | |
|---|---|
| Caucasian, 50-52% nom. | 35.00 |
| so. African,, 50-52% nom. | 35.00 |
| Indian, 50-52% | Nominal |

# Sheets

Sheet Prices, Page 206

**Pittsburgh**—Production of common and full finished sheets has moved up several points to nearly 50 per cent, best rate since last November. Galvanized sheet output is up 2 points to 65 per cent. Galvanized operations have been aided by an active farm market in the South and West, with jobber buying relatively lighter in the East. Aside from the better automotive outlook, sheet mills are hopeful of a continuation of gains in miscellaneous buying.

**Cleveland**—Sheet demand continues to improve slightly. Releases against previous orders are being pushed forward, although new business has appeared in smaller volume than was hoped for. Additional buying of any consequence by most auto builders is not anticipated until a definite sales trend for new models has been established.

**Chicago**—Improvement in releases from automotive and miscellaneous interests has stimulated sheet production here. Sales have tended upward, following a moderate letdown late in September. Demand from farm equipment makers is expanding, heavier production being most noticeable in the tractor division.

**Boston** — Demand for sheets for building repairs is heavy, notably for roofing. Jobber stocks in many instances are depleted and substantial orders have been placed with mills for prompt delivery. Deliveries are still subject to delay. Corrugated galvanized metal pipe needs for culverts are heavy. Industrial demand is slightly improved and releases for blue annealed by small tank fabricators are steady. Stamping and sheet metal working shops as a rule, however, are not buying in large volume.

**New York**—Sheet demand is becoming more diversified, with stove specifications brisk and makers of electric household appliances buying at a steadily increasing rate in building up stocks for the holiday trade. Releases from refrigerator manufacturers also have improved the past 30 days, a contra-seasonal trend. About 400 tons of sheets will be up for bids shortly for the Queens Bridge housing project. Jobber releases are heavier, although replacements still are being made conservatively.

**Philadelphia** — Automotive specifications have expanded further, with one plant now operating three shifts in several departments. The district radio maker, long closed by a strike, is expected to re-enter the market shortly. Enameling sheets are moving fairly well to stove and sign makers. Operations of the local galvanized producer are 35 per cent.

**Buffalo** — Small miscellaneous orders and a light automotive tonnage are holding sheet production at a fair rate, but large releases necessary to prevent a tapering in total volume are slow to appear. The leading producer here is resuming operations after a letdown of about a week.

**Cincinnati**—Rolling schedules of district sheet mills are above 50 per cent, highest in many months. Demand for prompt shipment indicates little or no material is going into inventory. Miscellaneous demand is broad, with most of recent gains attributed to the automotive industry.

**St. Louis**—Sheet demand has receded slightly from the September peak but still is regarded as satisfactory. Galvanized material leads shipments, with sizable deliveries to southern jobbers reported for small home building.

**Birmingham, Ala.** — Sheets are being produced at virtual capacity with much of the output as roofing sheets, although considerable manufacturers' sheets is being turned out.


MEMO:
NATIONAL METAL CONGRESS AND EXPOSITION, OCT. 17-21 . . . DETROIT . . . WHILE IN ATTENDANCE INCLUDE A VISIT AT
BOOTH C-425

AMPCO METAL
"The Metal without an Equal"

AT BOOTH C-425
. . . a representative showing of:

Ampco Metal
—rough and machined sand and centrifugal castings, forgings, rolled stock.

Ampcoloy A-3
—a perfected heat treatable aluminum bronze.

Trodaloy No. 1, Trodaloy No. 7, Ampcoloy 98-21
—high conductivity alloys for welding and electrical service.

AMPCO BERYLLIUM COPPER AND OTHER SPECIAL AMPCO ALLOYS

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# Strip

Strip Prices, Page 207

**Pittsburgh**—Strip production is slightly heavier here, hot and cold rolling mills now running a trifle under 40 per cent, highest rate for the year to date. A large number of miscellaneous consumers are providing good support to demand, while automotive needs are tending upward.

**Cleveland**—Small gains continue in strip demand from miscellaneous consumers. Specifications for narrow widths from electrical appliance manufacturers are encouraging, but requirements of automotive partsmakers are somewhat disappointing. Sellers see a favorable outlook for October in view of the steady demand from diversified channels and prospects for substantial gains in automotive needs later this month.

**Chicago**—Strip sales remain fairly steady, with occasional small gains noted. Automotive interests have been ordering cautiously, refraining from forward buying. Strip demand for manufacture of household appliances and other domestic products is improved but still is considered far from satisfactory.

**Boston** — While maintained at the recently improved level, the upward trend in narrow cold-rolled strip demand is less pronounced. Incoming orders are numerous, but consumers are doing little advance buying, specifying prompt delivery. Most automobile releases are by accessory and partsmakers with such volume from the mid-west trade leading. Some producers of parts in the East are operating at low levels. Miscellaneous demand is well sustained and inventories are small. Prices are steady as a rule, but some indirect shading on stainless strip is reported through waiving of certain extras in tonnage transactions. Some rerollers became dangerously short of some sizes of hot strip during recent delayed freight traffic and hot strip shipments against orders are heavier.

**New York**—While tonnage placed by the automobile trade has been under expectations, narrow cold-rolled strip buying is slightly heavier with miscellaneous manufacturing consumers releasing more tonnage. Advance buying is absent, most users buying frequently and keeping inventories down. As a result incoming volume is closely geared to actual consumption which is increasing in more directions.

**Birmingham, Ala.** — Strip continues somewhat less active as the cotton tie season wanes, although production of that specification is considerably greater than during the off-season. Other items in strip are being received in small lots.


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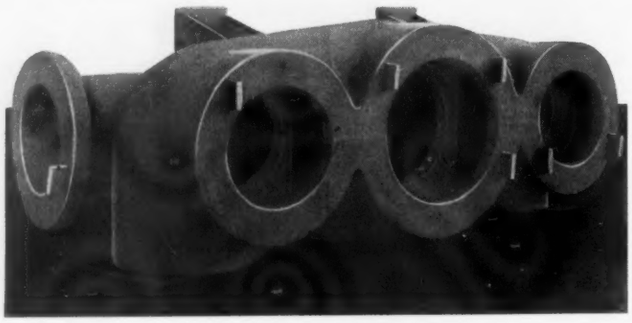

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# Plates

Plate Prices, Page 206

**Pittsburgh**—The plate outlook is fairly good, with a sizable amount of shipbuilding on the boards and a considerable number of public works projects to be let before the close of the year.

**Cleveland** — Plate sales are restricted here. Inquiries are slow to close, and no new business of consequence has appeared. While railroad demand is limited principally to miscellaneous repairs, the St. Louis San Francisco railroad is in the market for five locomotives.

**Chicago**—With the exception of 1000 tons pending for a pipe line, Colorado Springs, Colo., plate demand is moderate and spotty. Fabricators are busiest on storage tanks, with plate requirements, other than out of stock, rather low.

**Boston** — Plate shipments are

slightly heavier and new business expands gradually. Industrial demand tends upward moderately and specified projects, stimulated by federal loans, are developing. Shipyard releases are mounting and scattered gains in boiler and structural shop needs are noted. Railroads are also closing on routine fourth quarter requirements and releases during this period are expected to show some increase over the previous two quarters. Several large diameter steel pipe jobs are also about to come out.

**New York**—Plate sellers look for ship work to provide best demand the next few weeks. Prospective business includes several navy boats, a maximum of 15 cargo boats for the United States maritime commission and a vessel for the geodetic survey. Miscellaneous demand is slow. Business from oil companies is spotty, and boiler specifications continue light. A water tank and tower for Yonkers, N. Y., requiring 400 tons of shapes and plates, has been awarded.

**Philadelphia** — The maritime commission is expected to place contracts Nov. 10 for at least 12 passenger-cargo vessels requiring 49,680 tons of hull steel. The commission will consider bids on one to six vessels from each contractor. These vessels are in addition to the 12 coming up for bids Oct. 18. A Camden, N. J., yard is expected to receive the contract for a battleship, bids Oct. 19, requiring 10,790 tons of steel, including 7200 tons of carbon plates and 1300 tons of high tensile plates. New York Shipbuilding Corp. is low on two navy tenders requiring 6500 tons of hull steel each. Railroad requirements are negligible, but plates are moving better to oil storage tank and domestic boiler makers.

**Birmingham, Ala.** — Production of plates is well maintained because of activity of tank manufacturers and considerable business from railroad orders being worked on locally. Plates and sheets probably are the most active of local steel products.

**Seattle** — Small projects, mostly tank and boiler work, are the rule, no large plate jobs being up for figures. Washington state will open bids Oct. 18 for highway projects calling for about 10,000 feet of corrugated metal pipe.

**San Francisco** — Interest in the plate market centers around opening of bids by the metropolitan water district, Los Angeles, on a welded steel or reinforced concrete sheet lined steel pipe line, involving either 9000 tons of plates for the welded line or 3300 tons of sheets and 400 tons of rods for the present line. Moore Drydock Co. booked 825 tons for two lighthouse tenders for the government for delivery at Portland, Oreg., and Detroit.

## Plate Contracts Placed

910 tons, steel pipe, Minneapolis, to Minneapolis-Moline Power Implement Co., Minneapolis.

825 tons, two lighthouse tenders for government, one for delivery at Portland and one at Detroit, to Moore Drydock Co., Oakland, Calif.

300 tons, 1,000,000-gallon tank and tower, Fresno, Calif., to Chicago Bridge & Iron Works, Chicago.

250 tons, prefabricated barge sections, two barges, United States engineer, Fort Peck, Mont., for Wiota, Mont., to Midland Barge Co., Midland, Pa.

200 tons, 400,000-gal. tank and tower, Wickenburg, Ariz., to Allison Steel Mfg. Co., Phoenix, Ariz.

## Plate Contracts Pending

13,000 tons, hull steel, two navy tenders; New York Shipbuilding Corp., New York, low for general contracts.

9000 tons, 51-inch welded steel pipe line, metropolitan water district, Los Angeles; bids opened.

490 tons, tunnel liner plates, Lexington avenue sewer project, Rochester, N. Y., bids week of Oct. 10.


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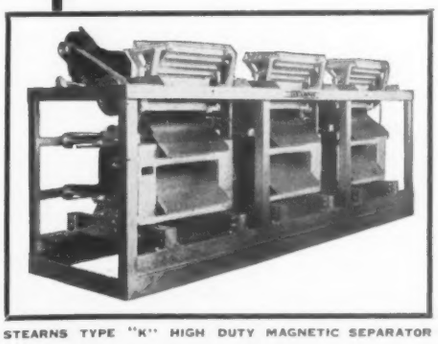

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# Behind the Scenes with STEEL

### Rose for Ross

■ You have in your masculine hands a very swell sample of industrial publishing. If you are a front-to-back reader you know this already but if you are a member of the cock-eyed clan (we are) who starts at the back cover and ends up with page one, then you have a treat in store. The Kleig lights are trained on the coming National Metal Congress and there is as much glamor to it as a preview at the Chinese Theater. Forty-four editorial pages in the special insert section give you a preview of the big show, an exclusive symposium on progress in the fabrication and treatment of metals with contributions by industry's leading lights, page after page of story-telling pictures, the complete program of the Congress and a list of exhibitors and their products. This outstanding job was marshalled together under the capable direction of STEEL's engineering editor, Erle F. Ross on whom we hereby pin a rose.

### Bridge of Size

■ And in this same issue, 'way up front on page 47 you don't want to miss the little history lesson in steelmaking. Especially do we suggest that you ponder over the striking thought under the fancy map at the top of the page. Think of the possibilities of that mile-wide strip of steel running from New York to San Francisco and then let your imagination go on a binge and figure out what would happen if the darned strip were turned around and stretched over to Europe. As you can see, it would put the steamships completely on the rocks and make a two weeks automobile trip abroad just an ordinary sort of vacation.

### Foreign News Dept.

■ Speaking of Europe reminds us of another of jokester Bradbury's clippings from *The Cleveland Press* during the recent squabble about plebiscites and minorities abroad. Mixed in with all the foreign news was an item with this headline: *Seeks Removal of Poles on Mayfield*. Just another plebiscite, thought Brad, until he read on to see they were telephone poles on Mayfield Heights Blvd!

### Right & Wrong

■ The mail bag last week built us up big and then let us down with a smack. American Tube Bending's Bulkely Smith writes from storm-struck New Haven, Conn., to call attention as others did to our item Sept. 12 which literally predicted the hurricane and only failed to name the place. To Mr. Smith and his fellow sufferers we know it wasn't funny and we promise not to cause anything like that again. We just don't know our own strength, but Frank L. Sessions of Cleveland proves we know even less than that. Last week we told a little yarn about a thousand $1000 bills, how they were an inch high and how a billion dollars would pile up to the top of an eight story building. Well, Mr. Sessions didn't believe it so he took out his micrometer and discovered the bills are 3/1000 of an inch thick. So, the million dollar stack would be 3 inches and the billion smackers would reach up 250 feet. Mr. S. blamed it all on the New Deal and Secretary Morgenthau but it's our fault. It was right before payday and there wasn't a piece of folding money in the office.

### Surprise in Store

■ When you come in the main entrance of the Auditorium next week at the Metal Show, take a sharp turn to the left and come over one aisle to Booth A-203. There you will be greeted with a warm smile and friendly shake. While you are getting your bearings (we don't sell them) and deciding what you want to see first you can at the same time get a glimpse of what we fully expect will be the outstanding service of the show.

—Shrdlu

*—The Market Week—*

# Bars

Bar Prices, Page 206

**Pittsburgh**—While hot-rolled bar demand lately has leveled off, some rebound is looked for the next few weeks, since a pickup in automotive needs appears assured. Motor car requirements are expected to offset any continued lull in business elsewhere.

**Cleveland** — Bar demand shows little change so far this month. Specifications from automotive partsmakers are somewhat disappointing, and little improvement is anticipated until late this month. Railroad orders are restricted to necessary repairs, while needs of farm equipment builders have gained only slightly. While mill operations remain at relatively low levels, a slight pickup is seen before the end of October.

**Chicago**—Improvement in carbon and alloy bar sales and specifications is reflected in production gains. Heavier automotive orders chiefly are responsible for the betterment, although an increase in miscellaneous demand is of almost equal importance. Expansion of operations at tractor plants enhances prospects for heavier steel requirements in the farm equipment industry. Demand from this outlet recently had been dull.

**Boston** — Commercial steel bar buying improves slowly. While orders are slightly more numerous the aggregate tonnage being placed is small. Alloy demand holds relatively better than soft steel and forging shop requirements have been below expectations. Slight improvement in orders placed with builders of textile mill equipment has not yet been reflected in better releases of cold-finished bars.

**New York** — Bar tonnage recently has been little more than sustained at the average rate of the past month. Buying is still spotty and on a hand-to-mouth basis. Sellers generally, however, anticipated an improvement this month, particularly from the automobile accessory manufacturers and in a limited degree from the railroads. Government specifications, involving principally cold drawn bars and alloy bars, are a little less active than a week ago, although this may be only temporary, according to leading sellers, who believe that the government will continue to expand its munitions program even though a general outbreak of hostilities in Europe was recently averted.

**Philadelphia** — Miscellaneous bar demand is tending upward, especially in hot rolled alloy and cold drawn

bar specifications. Warehouses are buying needed sizes but stocks are regarded as extremely low.

**Buffalo**—Heavier orders from the automotive industry are reflected in more active operations of bar mills. While still relatively small, inquiries from motor interests give indications of boosting market activity. Better business in structural work also is helping demand.

**Birmingham, Ala.** — With the exception of concrete reinforcing bars, bar business is hardly more than fair. Quite a bit of miscellaneous business, however, is coming in for concrete bars.

# Pipe

Pipe Prices, Page 207

**Pittsburgh**—Variations in demand for tubular products are slight. Oil country business continues fair, with drill pipe and casing accounting for the bulk of orders. The line pipe market is quiet as financing has yet to be arranged for some promising work currently under consideration. Standard pipe demand is unchanged although substantial buying for housing projects is in prospect. Railroad inactivity contributes to a quiet market for boiler tubes.

**Cleveland**—Demand for steel pipe out of jobbers' stocks generally is unchanged. Needs of industrial users have improved only slightly, while domestic consumption has increased seasonally. Cast iron pipe demand from small municipalities continues to expand as anticipated. Orders include 325 tons for water distribution systems at Lakemore and Smithfield, O., and 750 tons for a new water intake project at Sandusky, O.

**Chicago**—Cast pipe demand continues slow, only small lots being involved in work now pending. The immediate outlook is regarded without optimism as no large projects are in prospect. WPA requirements are appearing in the market frequently but for small lots, while PWA construction has been responsible for some orders lately.

**New York** — Except for various housing projects and a number of small apartment buildings, little merchant pipe is being figured here. The Queens bridge housing development, taking about 2000 tons for heating and plumbing, is expected to come up for bids later this month.

Purchase of 1500 tons, including fittings, for installation at the North Beach airport, New York, is the largest of recent cast pipe contracts. Buying is confined mostly to small fill-in lots. Inquiry is also light, but indications are New York City will ask quotations on close to 9500 tons next month.

**Birmingham, Ala.** — The period of watchful waiting continues in the pipe industry due to failure of specifications to materialize for much of the government business now under consideration. Inquiries from private sources are practically absent.

**Seattle** — Immediate demand for cast iron pipe is not impressive although important tonnages are involved in many Pacific Northwest municipal projects, planned and filed for PWA assistance. Washington cities with proposed water system improvements include Cle Elum, $205,915; Leavenworth, $87,107; Okanogan, $25,000, involving 8-inch cast iron; Moxee, $46,000; Moses Lake, $66,000, and Wilkeson $25,000. Some of these towns have already received PWA grants and bids will be invited in the near future.

**San Francisco** — Inquiries for cast iron pipe continue to come out slowly and the only new inquiry of size involves 641 tons of 8 to 16-inch pipe for the east bay municipal utility district, Oakland, Calif.,


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Oct. 12. Awards aggregated 1343 tons, bringing the total to date to 24,905 tons as compared with 22,797 tons for the corresponding period in 1937.

## Cast Pipe Placed

1500 tons, including fittings, North Beach airport, New York, to United States Pipe & Foundry Co., Burlington, N. J., through procurement division, treasury department, New York.

770 tons, 6 and 12-inch, Pacific Colony, Spadra, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

553 tons, 16-inch pipe, Eleventh naval district, San Diego, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

## Cast Pipe Pending

641 tons, 8 to 16-inch, Class 150, east bay municipal utility district, Oakland, Calif.; bids Oct. 12.

# Wire

**Wire Prices, Page 207**

**Pittsburgh** — Wire production is steady at 60 to 70 per cent, with demand evenly divided between merchant and manufacturers' wire products. Farm needs in the South are holding well, with a little more activity noted from northern jobbers. Releases against automotive orders are somewhat better, while orders from miscellaneous manufacturing consumers are steady. September production was the highest for the year to date, and October is expected to show a still better record. Aside from some of the merchant divisions, prices are holding well. Usual weakness is present in certain merchant divisions, especially in southern districts.

**Cleveland** — Improvement in wire and wire rod activity is restricted to automotive suppliers who have been stepping up production gradually to meet peak demand from auto builders. Merchant wire specifications remain seasonally dull, but sellers anticipate a small improvement in consumption in rural areas the remainder of the month. Mill operations are erratic, with the average moderately above the September rate.

**Boston** — Finishing operations in some wire mill departments approximate 60 per cent with demand well sustained. Scattered gains in volume, mostly specialties, are noted. Most orders are for prompt delivery and mills are unable to build backlogs except on a few items. While heavier than a month ago, automobile buying has been somewhat disappointing. The textile industry is also contributing little tonnage. Mills are sustained largely by well diversified miscellaneous demand. On round wire some scattered shading is reported, but in general prices are firm. Production of semifinished material is the heaviest thus far this year. Deliveries are improving, but are not yet normal.

**Chicago**—Wire and wire products demand continues to improve steadily. Automotive releases are heavier, while activity elsewhere is well sustained. Business has experienced a slow but steady improvement over an extended period, and prospects remain good that the gradual betterment will be maintained, at least until late fall.

**New York** — Well diversified demand for wire continues with additional gains in volume for some products. Better demand prevails for manufacturers' wire and a number of specialties. Despite a lag in automobile buying, demand for spring wire is brisk, notably from the furniture trade. Rope orders are slightly improved, but electrical goods are slow, although the government is placing some attractive business for various departments. Demand for rods is slow to improve, although there are scattered gains.

# Rails, Cars

**Track Material Prices, Page 207**

New York Central has distributed orders for approximately 30,500 tons of rails among four companies: Bethlehem Steel Co., Bethlehem, Pa.; Carnegie-Illinois Steel Co., Pittsburgh; Inland Steel Co., Chicago; and the Algoma Steel Corp., Sault Ste. Marie, Ont.

Recipients of 8000 tons of accessory orders were the American Fork & Hoe Co., Bethlehem Steel Co., Carnegie-Illinois Corp., Cleveland Frog & Crossing Co., Cleveland; Creepcheck Co. Inc., New York; Illinois Malleable Iron Co., Chicago; Inland Steel Co.; Jones & Laughlin Steel Corp., Pittsburgh; Morden Frog & Crossing Works, Chicago; P. & M. Co., Chicago; Ramapo Ajax division of American Car & Foundry Co., New York; Republic Steel Corp., Cleveland; Taylor-Wharton Iron & Steel Co., High Bridge, N. J.; Weir Kilby Corp., Cincinnati; Weirton Steel Co., Weirton, W. Va.; Wheeling Steel Co., Wheeling, W. Va.; Woodings Forge & Tool Co., Verona, Pa.; and Youngstown Sheet & Tube Co., Youngstown, O.

New York's procurement division will readvertise for bids on approximately 100 tons of rails plus

accessories. The original date of opening was Oct. 4.

Domestic freight car awards in September involved 1750 cars, the second best monthly showing this year. Only the May figure was higher. September bookings brought the total for the first nine months to 9983, compared with 49,799 in the corresponding period of last year; 37,313 in the corresponding period in 1936 and 7908 in the first nine months of 1935. Last month's total compared with 182 in August and none in July.

Further comparisons follow:

| | 1938 | 1937 | 1936 | 1935 |
|---|---|---|---|---|
| Jan. .... | 25 | 17,806 | 2,050 | 24 |
| Feb. .... | 109 | 4,972 | 6,900 | 806 |
| March.... | 680 | 8,155 | 632 | 0 |
| April..... | 15 | 9,772 | 4,427 | 350 |
| May..... | 6,014 | 4,732 | 8,900 | 2 |
| June ..... | 1,178 | 548 | 5,200 | 5,151 |
| July..... | 0 | 1,030 | 7,229 | 500 |
| Aug. .... | 182 | 1,475 | 225 | 200 |
| Sept..... | 1,750 | 1,216 | 1,750 | 875 |
| 9 mos. .... | 9,983 | 49,799 | 37,313 | 7,908 |
| Oct. .... | ..... | 1,355 | 2,210 | 1,250 |
| Nov. .... | ..... | 275 | 1,550 | 100 |
| Dec. .... | ..... | 275 | 23,450 | 10,050 |
| Total . | ..... | 51,611 | 64,643 | 19,308 |

The outstanding award involved 1000 all steel box cars for the Illinois Central on a lease-purchase arrangement. Work on the Illinois Central cars is scheduled to begin in November at the St. Louis shops of the American Car & Foundry Co. Prospects for this month are for decline, as pending inquiry is almost negligible.

Chicago & Illinois Midland will repair fifty 70-ton gondolas in its own shops. Locomotive inquiry is featured by five 4-8-2 locomotives for the St. Louis-San Francisco.

## Rail Orders Placed

New York Central, 30,500 tons rails, to Bethlehem Steel Co., Carnegie-Illinois Steel Corp., Inland Steel Co., Algoma Steel Corp.; 8000 tons of accessories distributed among various suppliers.

## Locomotives Pending

St. Louis-San Francisco, five 4-8-2 type locomotives; bids asked.

## Ferroalloys

**Ferroalloy Prices, Page 208**

**New York** — A further increase in ferromanganese shipments is expected this month, following a gain of 15 to 20 per cent for September and a similar gain for August. Domestic prices are steady at $92.50, duty paid, Atlantic and Gulf ports. Prices on imported ferromanganese are also maintaining a greater strength noted a fortnight or so ago. Domestic spiegeleisen, 19 to 21 per cent, is steady at $28, Palmerton, Pa., and 26 to 28 per cent, at $33. Other leading ferroalloys also are unchanged.

# Shapes

**Structural Shape Prices, Page 206**

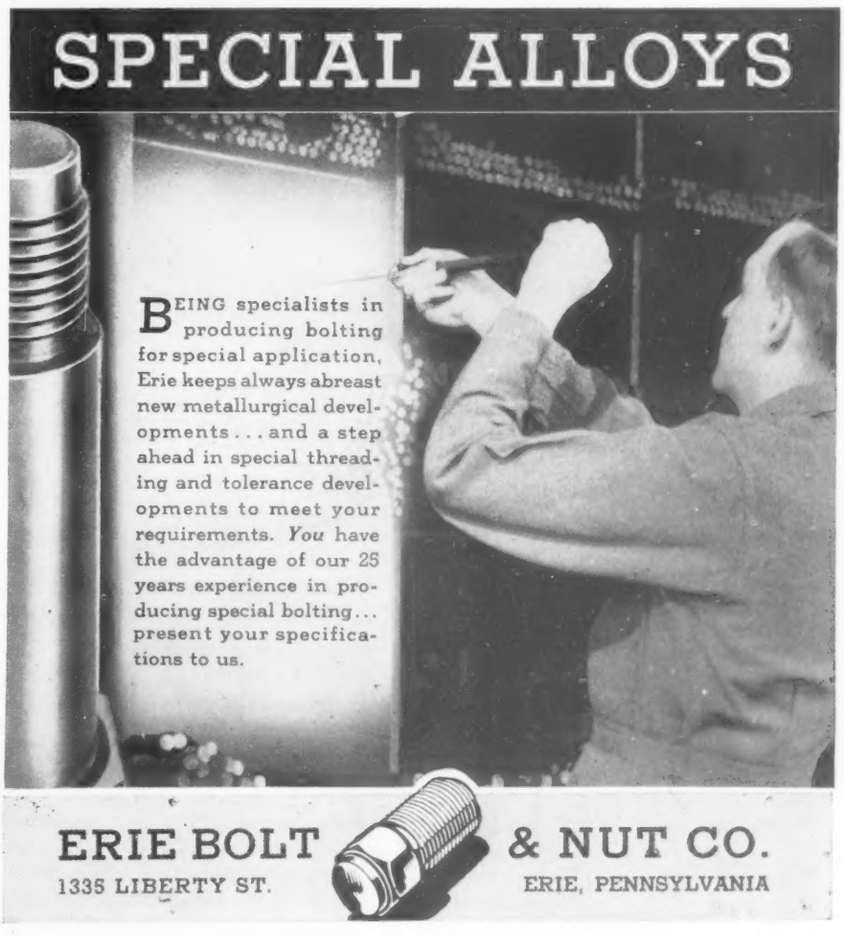
**Pittsburgh** — Structural inquiries are more numerous, but tonnages involved are slightly less in the absence of many large projects. Public works predominate. In addition to 1700 tons for a building at Brooklyn navy yard, leading inquiries include 900 tons each for a municipal court building, Washington, and an addition to McKenzie high school, Detroit.

**Cleveland** — Structural needs for private work continue restricted to small lots, the factory building for Weldrods Inc., Cuyahoga Falls, O., involving 200 tons, being the outstanding project pending. Inquiries for public construction, however, continue to expand. Bids are in on about 1000 tons of bearing piles for a government project at Gordon park, Cleveland. Visintine Construction Co., Cincinnati, has been awarded the general contract for a 354-ton state bridge, Columbus, O. Numerous schools are coming up for bids soon, taking small individual tonnages. Fabricated prices remain weak.

**Chicago** — Structural shape demand is well maintained, although few new inquiries involve large lots. Bridges predominate major jobs among recent inquiries. Small miscellaneous projects are numerous. Awards include 350 tons for a Masonic temple, Marquette, Mich., 250 tons for a bridge, Mitchell, Ill., and 250 tons for a Chicago & Eastern Illinois railroad coach shop, Danville, Ill.

**Boston** — Close to 500 tons of structural steel will be required to repair a bridge, Chicopee Falls, Mass., estimates for which will be asked soon. Meanwhile awards are down with the exception of small miscellaneous lots. Few large inquiries are up for figures, although the number of projects ranging from 100 to 300 tons are mounting.

**New York** — Structural contracts for world's fair buildings approximate 2000 tons, which with 3000 tons for an apartment building, Riverside drive, New York, are outstanding. The total tonnage placed is down considerably. New inquiries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for more than 1000 tons each include: Building No. 4, Brooklyn navy yard; administration building, Bellevue hospital, and a municipal court house, Washington. New York and New Jersey state bridges up for estimates, or bid, account for 2000 tons, mostly small, 533 tons for Herkimer county, New York, being the largest. Fabricated structural steel prices continue weak.

**Philadelphia** — Philadelphia navy yard is taking bids Oct. 26, for a structural assembly shop, requiring 3000 tons and a turret shop taking 1000 tons. Bethlehem Steel Co., Bethlehem, Pa., is low on 960 tons for reserve basin storehouse on direct bids, while Ralph H. Herzog, Philadelphia, is low on the general contract for the machine shop, building No. 16, taking 1300 tons. Additional public work is now being figured, but private jobs lag.

**Buffalo** — Although fabricators have not yet felt the effects, the structural steel market is more active, with bidding dates on several sizable WPA jobs announced.. Many other projects are still in the drawing stage. New projects include 400 tons of structural and 100 tons of reinforcing, for the Adults' building, Niagara county sanitarium, bids Oct. 13.

**Seattle** — One of the year's largest contracts, involving approximately 15,000 tons, will probably go to Bethlehem Steel Co. for the Narrows suspension bridge at Tacoma. Low combined bidder at $5,949,730, for the Narrows suspension bridge, was Pacific Bridge Co., San Francisco, General Construction Co., Seattle, and Columbia Construction Co., Bonneville. RFC has granted a loan of $3,300,000 for the toll structure and awards will likely be made immediately.

## Shape Contracts Placed

1700 tons, Russian government building, world's fair, New York, to Harris Structural Steel Co., New York; Hegeman-Harris Co., New York, general contractors.

1000 tons, transit shed, Long Beach, Calif., to Bethlehem Steel Co., Los Angeles.

960 tons, reserve basin storehouse, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.

845 tons, state office building, Nashville, Tenn., to Nashville Bridge Co., Nashville.

780 tons, superstructure, Chickamauga power house, Tennessee valley authority, Knoxville, Tenn., to American Bridge Co., Pittsburgh, $44,635; bids Sept. 8.

515 tons, building addition, Pekin, Ill., to Vierling Steel Works, Chicago.

510 tons, addition, Twelfth street station, Richmond, Va., to Virginia Bridge & Iron Co., Roanoke, Va.

425 tons, Bottling plant, Coca Cola Bottling Co., Baltimore, to Bethlehem Steel Co., Bethlehem, Pa.

400 tons, public school 27, Brooklyn, N. Y., to Bethlehem Fabricators Inc., Bethlehem, Pa.; bids Sept. 30 to procurement division, treasury department, New York, steel direct.

400 tons, Port Allen wharf, Kauai, T. H., to unnamed interest.

350 tons, three warehouses Fort Lewis, Wash., to Star Iron & Steel Co., Tacoma, previously reported as awarded to Ingalls Iron Works.

350 tons, metal shop building, United States coast guard, Curtis Bay, Md., to Bethlehem Fabricators Inc. Bethlehem, Pa.

350 tons, Masonic temple, Marquette, Mich., to Milwaukee Bridge Co., Milwaukee.

335 tons, building, Sutherland Paper Co., Kalamazoo, Mich., to Edwards Iron Works, Inc., South Bend, Ind.

330 tons, to lighthouse tenders for government, one for Portland and one for Detroit delivery, to Moore Drydock Co., Oakland, Calif.

300 tons, school, Goshen, N. Y., to Bethlehem Steel Co., Bethlehem, Pa.

260 tons, state bridge 5804, Little Fork, Minn., to Bethlehem Steel Co., Bethlehem, Pa.

250 tons, field house, Southwest Missouri State Teachers college, Springfield, Mo., to International Steel & Iron Co., Chicago.

250 tons, Chicago & Eastern Illinois railroad coach shop, Danville, Ill., to American Bridge Co., Pittsburgh; through Austin Co., Cleveland.

250 tons, highway bridge, Mitchell, Ill., to Stupp Bros. Bridge & Iron Co., St. Louis.

250 tons, municipal garage, Cambridge, Mass., to American Bridge Co., Pittsburgh.

250 tons, addition to Swift & Co., Vernon, Calif., to Western Pipe & Steel Co., Los Angeles.

230 tons, residence, C. W. Wheelwright, Green Spring Valley, Md., to Maryland Steel Products Co., Baltimore.

205 tons, high school, Baldwin township, Allegheny, Pa., to Guibert Steel Co., Pittsburgh.

180 tons, two 405-foot towers, Natchez, Miss., to Lehigh Structural Steel Co., Allentown, Pa.

175 tons, Argentine building, world's fair, New York, to Lehigh Structural Steel Co., Allentown, Pa.

175 tons, state highway bridge, Mahaffey, Pa., to Bethlehem Steel Co., Bethlehem, Pa.

165 tons, bridge 582-G, Outagamie county, Wisconsin, to Fort Pitt Bridge works, Pittsburgh.

155 tons, 11 transmission towers, Chattanooga, Tenn., Tennessee valley authority, to Lehigh Structural Steel Co., Allentown, Pa.

150 tons, school, Meriden, Conn., for state, to American Bridge Co., Pittsburgh.

133 tons, sheet piling, Salinas river

## Shape Awards Compared

| | Tons |
|---|---|
| **Week ended Oct. 8** | **13,202** |
| **Week ended Oct. 1** | **50,088** |
| **Week ended Sept. 24** | **13,065** |
| **This week, 1937** | **10,845** |
| **Weekly average, year, 1937** | **23,251** |
| **Weekly average, 1938** | **19,572** |
| **Weekly average, September** | **36,500** |
| **Total to date, 1937** | **1,004,414** |
| **Total to date, 1938** | **802,438*** |

* Revised

Includes awards of 100 tons or more.

bridge, Calif., to unnamed interest.
129 tons, crossing in Yellowstone and in Meagher county, Montana, to unnamed interest.
125 tons, state highway bridge, Washington, Ind., to Central States Bridge & Steel Co., Indianapolis, Ind.
125 tons, crossing near Ben Ali, Sacramento county, California, for state, to Ingalls Iron Works, Birmingham, Ala.
115 tons, quartermaster garage, Scott Field, Illinois, to Stupp Bros. Bridge & Iron Co., St. Louis.
110 tons, Crowe garage, Lexington, Ky., to Snead Architectural Iron Works, Louisville, Ky.
110 tons, bridge, Belfast street, Bath, N. Y., U. S. veterans administration, to American Bridge Co., Pittsburgh.
110 tons, reservoir, Pittsburgh, N. H., to Stafford Iron Works, Worcester, Mass.
100 tons, high school, Tucson, Ariz., to unnamed interest.

## Shape Contracts Pending

16,066 tons, shapes, cable, sheet steel and H column piles, Narrows bridge, Tacoma, Wash.; Pacific Bridge Co., San Francisco; General Construction Co., Seattle and Columbia Construction Co., Bonneville, Oreg., low at $5,949,730 on general contract with Columbia Steel Co., San Francisco, second low at $6,038,560.
16,000 tons, transmission towers for water and power department, Los Angeles; bids Nov. 15.
5487 tons, shapes and bars, Prado dam, Orange-Riverside county, California, for United States Engineer office, Los Angeles; general contract to W. E. Callahan Construction Co., J. P. Shirley; Guthrie, Marsch, Peterson Co. and Geo. W. Condon Co., Los Angeles at $3,640,795.
3000 tons, assembly shop, Philadelphia navy yard; bids Oct. 26.
3000 tons, municipal court building, Washington; bids Oct. 11.
2000 tons, addition, veterans' hospital, Bronx, N. Y.; bids Oct. 27, Washington.
1500 tons, building No. 4, navy yard, Brooklyn, N. Y.; bids Oct. 25.
1500 tons, administration building, Bellevue hospital, New York; bids Oct. 13.
1300 tons, machine shop, building, No. 16; Ralph H. Herzog, Philadelphia, low on general contract.
1000 tons, bearing piles, government project, Gordon park, Cleveland; bids in.
1000 tons, municipal courthouse, Washington; bids Oct. 11, include 200 tons of bars.
1000 tons, turret shop, Philadelphia navy yard; bids Oct. 26.
900 tons, addition No. 3, McKenzie high school, Detroit.
750 tons, power house superstructure, Chickamauga dam; American Bridge Co., Pittsburgh, low. Erroneously reported as awarded to Stupp Bros. Bridge & Iron Co., St. Louis, in the Sept. 26 issue.
719 tons, building additions, Puget Sound navy yard; bids in.
686 tons, bridge over Santa Ana river, near Prado, Calif.; Columbia Steel Co., San Francisco, low.
600 tons, two 184-foot truss spans, Westfield, Mass.; bids postponed to Oct. 10 from Oct. 3.
580 tons, apartment, Lexington avenue and Thirty-seventh street, New York.
533 tons, state highway bridge, RC-4000, Herkimer county, New York; bids Oct. 25, Albany.
500 tons, state highway bridge, Lane, Idaho.
500 tons, bridge replacement, Chicopee Falls, Mass.; bids soon.
450 tons, postoffice and court house, St. Joseph, Mo.; A. Farnell Blair, Lake Charles, La., low.
450 tons, state bridge over Holmes creek, Vernon, Fla.
400 tons, bridge, Clinton, Miss.
400 tons, adults' building, Niagara county sanitarium, N. Y.; bids Oct. 13.
400 tons, state bridges, Passaic county, New Jersey.
375 tons, state bridge 381, FAP-475-D (1), Downsville, Wis.
360 tons, alterations to warehouse, Reading Co., Philadelphia.
350 tons, bridge, Clark county, Ohio; Visintine Construction Co., Cincinnati, low.
325 tons, state bridges over Harbor river and Johnston creek, Port Royal, S. C.
310 tons, high school, Coatesville, Pa.; John McShain Inc., Philadelphia, low.
275 tons, state bridge over Santa Fe river, Sewanee county, Florida.
261 tons, bridge, Rainers, Miss.
250 tons, Brazilian building, world's fair, New York; Hegeman-Harris Co., New York, general contractor.
240 tons, bridge, Goshen-Michigan Corners, Orange county, New York; John Arborio, Inc., Poughkeepsie, N. Y., general contractor $59,318.30, bids Sept. 27, Albany.
215 tons, plate girder bridge, FAGS-1-A (1), Sturtevant, Wis., for state.
215 tons, gate chamber bracing, Newkirk, N. Mex., for government.
200 tons, home for aged, Hamburg, N. Y., John Schaaf, Buffalo, low.
200 tons, school, West Lynn, Mass.; taking bids.
200 tons, two state bridges, FAS-604-C, FA, route 168, Holton, Ill.
175 tons, viaduct, Garfield avenue, Duluth, Minn., for state.
170 tons, waterworks improvements, Rock Island, Ill.
160 tons, bridge, East Elmira, Chemung county, New York; E. V. Chappell, Binghamton, N. Y., general contractor, $57,334, bids Sept. 27, Albany.
160 tons, bridge, Dover, O.; bids in.
150 tons, school, Mayville, N. Y.; bids Oct. 22.
150 tons, state highway bridge FAS-28-A, SA, route 23, West Point, Ill.
150 tons, state bridges, Warren county, New Jersey.
135 tons, state highway bridge, Grace, Idaho.
120 tons, school, Oil City, Pa.
120 tons, shapes and bars, high school, Marshfield, Mass.; bids Oct. 18.
105 tons, radio, telephone and telegraph building, Fort Devens, Mass.; bids Oct. 10.
102 tons, bridge, Jamestown-Bemus Point, Chautauqua county, New York; Peter J. Knickenberg, Buffalo, general contractor, $294,877.45, also includes 225 tons of highway mesh for road, bids Sept. 27, Albany.
100 tons, Irish Free state building, world's fair, New York; Hegeman-Harris Co., New York, general contractor.
100 tons, I-beam bridges, Velvidere and Benson, Vt.; bids Oct. 14 and 19, Montpelier.
100 tons, hangar, Buffalo airport; bids Oct. 11.
Unstated, 495-foot state bridge, Kootenai county, Idaho; Sather & Son, Seattle, low.

## Cold-Finished

**Cold Finished Prices, Page 207**

**Pittsburgh**—Automotive demand has been instrumental in sustaining cold finished bar production. Mis-

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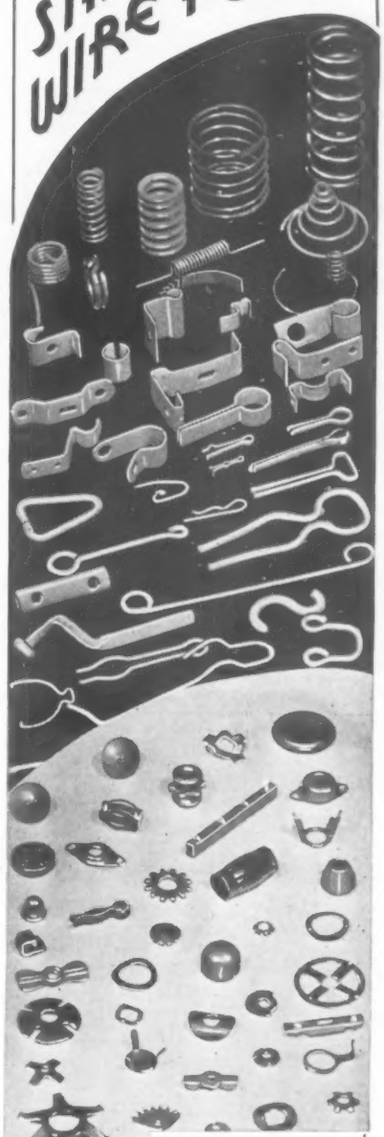

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cellaneous orders are increasing slowly, but business from farm equipment builders remains slow. October has prospects of at least equalling September bookings, due to anticipated gains in automotive needs.

# Reinforcing

**Reinforcing Bar Prices, Page 207**

**Pittsburgh** — Reinforcing demand is slow at the present, with few contracts placed and little business coming out. There is a fair tonnage in the market awaiting placement and a good many jobs on the boards which are not yet ready for bids. The price situation remains unchanged. The tendency toward a firmer market appears to be holding its own, with prices better in many sections. Small jobs are still weak, with jobbers' quotations varying widely.

**Cleveland** — Outstanding bar award of the week involved 1500 tons for the west approach to the Main street bridge, Cleveland. Pending projects include 160 tons for a state bridge, Dover, O., and additional bridges in Pickaway and Clark counties, Ohio. A number of state schools are taking a considerable tonnage of joists. Private work is restricted to small tonnages. Fabricated prices are weak.

**Chicago**—While concrete bar sales show little change, sellers are busier estimating new work, principally public projects. Inquiries point to a pickup in demand in the near future, with private construction sharing partly in the better activity furnished principally by government work. Bookings of individual lots of less than 100 tons are fairly numerous.

**Boston** — Reinforcing steel orders are numerous, but few large tonnages are required. For barracks, Fort Devens, Mass., 500 tons is the leading contract. New work is coming out in slightly better volume, almost entirely for public construction.

**New York** — Reinforcing steel buying and inquiry has decreased, few large transactions being noted with prices still soft and erratic. New Jersey closes on bridges and highways this week, taking several hundred tons. A prison wall, Greenhaven, N. Y., Arthur Gallow Co., New York, contractor, 600 tons, is expected to be closed shortly. Highway mesh needs again tend upward, 500 tons being placed for Connecticut sections, 1300 tons being estimated for New York state.

**Philadelphia**—Karno Smith, Trenton, N. J., is low bidder on a sewage disposal plant, Hamilton Township, N. J., taking 200 tons. Bids are due Oct. 11 for a research laboratory, Beltsville, Md., taking 250 tons. Several road and building jobs are before the trade, but total coming out is not sufficient to keep district fabricating shops busy. Prices remain weak.

**Buffalo** — Activity in reinforcing steel is expanding. Lack of large inquiries is offset by increased number of small jobs. The 300-ton Lexington avenue sewer project in Rochester will be awarded next week. Several smaller jobs calling for 100 tons or less are on the books. Rolling mills are maintaining fairly active production schedules.

## Reinforcing Steel Awards

1500 tons, west approach to Main street bridge, Cleveland, to Patterson-Leitch Co., Cleveland; through Sam W. Emerson Co., Cleveland.

885 tons, Port Allen wharf, Kauai, T. H., to unnamed interest.

667 tons, six state girder bridges, Methow, Wash., to Bethlehem Steel Co., Seattle; Roy L. Bair, Spokane, general contractor.

500 tons, highway project, Merritt parkway, Westport, Conn. to Truscon Steel Co., Youngstown, O.; A. I. Savin Construction Co., East Hartford, Conn., general contractor; previously reported as 150 tons.

350 tons, addition to Swift & Co. plant, Vernon, Calif., to Truscon Steel Co., Los Angeles.

250 tons, high school, Ventura, Calif., to unnamed interest.

238 tons, Treasury department, invitation 45,486, Los Angeles, to Bethlehem Steel Co., Los Angeles.

114 tons, highway work Graham county, Arizona, to unnamed interest.

105 tons, Cheney, Wash., state normal school, to Bethlehem Steel Co., Seattle; J. T. Hallin, Spokane, general contractor.

105 tons, bureau of reclamation invitation A-33,764-A, Crownover, Wash., to Bethlehem Steel Co., Bethlehem, Pa.

100 tons, dormitory, Virginia Polytechnic institute, Blacksburg, Va., to Beth-

## Concrete Bars Compared

| | Tons |
|---|---|
| Week ended Oct. 8 | 4,814 |
| Week ended Oct. 1 | 9,106* |
| Week ended Sept. 24 | 5,113 |
| This week, 1937 | 2,778 |
| Weekly average, 1938 | 6,441 |
| Weekly average, year, 1937 | 6,061 |
| Weekly average, September | 10,950 |
| Total to date, 1937 | 257,445 |
| Total to date, 1938 | 264,096* |

* Revised

Includes awards of 100 tons or more.


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lehem Steel Co., Bethlehem, Pa.
100 tons, malt house for Miller Malting Co., Los Angeles, to unnamed interest.
100 tons, repairs to McKinley high school, Pasadena, Calif., to unnamed interest.
100 tons, transit shed, Long Beach, Calif., to unnamed interest.

## Reinforcing Steel Pending

1618 tons, Narrows toll suspension bridge, Tacoma, Wash.; General Construction Co., Seattle, and associates, low at $5,949,730.
1287 tons, placing, relocation Southern Pacific Co tracks near Redding, Calif.; Granfield, Farrar & Carlin, San Francisco, and Western Construction Co., Monrovia, Calif., low at $1,717,361.
1000 tons, footings for Bonneville transmission towers; American Bridge Co., Pittsburgh, general contractor.
750 tons, two barracks Fort Lewis, Wash.; Geo. A. Fuller Co., Los Angeles, low.
600 tons, addition to 7-story storehouse, specification 8911, naval base, San Diego, Calif.; Wm. P. Neil Co., Los Angeles, low at $410,000.
427 tons, including shapes and miscellaneous, fish control station, Leavenworth, Wash.; bids to reclamation bureau, Coule City, Wash., Oct. 20.
400 tons, water filtration plant, Gloversville, N. Y.
300 tons, Lexington avenue sewer project, Rochester, N. Y.; bids soon.
300 tons, receiving hospital, Pontiac, Mich.
278 tons, pumping plants, Contra Costa canal near Antioch, Calif., Central Valley project; bid Oct. 14.
170 tons, men's dormitory, Madison, Wis.
160 tons, pump housing and administration building, Waterloo, Iowa.
120 tons, power house, Newberry, Mich.
114 tons, two bridges, Riverside county, California, for state; bids Oct. 20.
112 tons, crossing of Southern Pacific Co. tracks near Saugus, Los Angeles county, California; bids Oct. 20.
109 tons, bridge near Fillmore, Los Angeles county, California, for state; bids Oct. 20.
103 tons, bridge, Chaffee county, Colorado, for state; bids Oct. 11.
100 tons, Washington state highway projects; bids at Olympia, Oct. 18.
100 tons, home for aged, Hamburg, N. Y.; John Schaaf, Buffalo, low.
100 tons, adults' building, Niagara county sanitarium, N. Y.; bids Oct. 13.

# Pig Iron

**Pig Iron Prices, Page 208**

**Pittsburgh**—Pig iron releases are slightly heavier as a result of a similar trend in foundry operations. New business is quiet and the recently advanced market is untested. Blast furnace schedules are unchanged, with three merchant stacks in operation, in addition to those units operated by steelworks who also sell pig iron.

**Cleveland** — While pig iron releases show little change, sellers look for a gain of about 10 per cent in October shipments, due primarily to a prospective increase in automotive needs. Deliveries to machine tool builders and heating appliance foundries are heavier though not up to expectations, while consumption by makers of railroad castings remains slow. Consumers are well covered for this quarter and in a few instances for a longer period.

**Chicago** — Pig iron buying has dwindled since the recent price advance became effective. While this condition is expected to continue through October, in view of the extensive forward coverage previously, some increase in shipments is looked for. Automotive needs are contributing to expansion in foundry operations.

**Boston** — Pig iron buying has slumped to scattered small lots, few car loads being involved, following a mild flurry which developed just previous to the recent price advance. Shipments are light, with the bulk of new purchases to be delivered later this quarter. Foundries in some instances are slow to get back to even the low operations prevailing before the recent storm.

**New York**—Most pig iron consumers are well covered for the remainder of the year and, in some instances, for part of early 1939, unless consumption shows an unexpectedly sharp increase. Part of this coverage occurred before the recent price advance drove in additional orders, latest buying not having been excessively heavy.

An eastern Pennsylvania furnace has booked 20,000 tons of basic pig iron for shipment to a Mediterranean port.

**Philadelphia** — A lull has developed in new business, but shipments lately are encouraging. September orders for gray iron castings are reported as 5 to 10 per cent heavier than in August. The Conshohocken, Pa., interest has blown in a blast furnace, idle since last May.

**Buffalo** — Pig iron output is up for the third time since mid-August with the blowing in of one blast furnace each by Republic Steel and Hanna Furnace corporations. This raises output for the district to 50 per cent of blast furnace capacity.

**Cincinnati** — Pig iron consumption by heating equipment manufacturers is heavier, but the melt elsewhere is slow to show anticipated improvement. Extensive ordering prior to price advances has resulted in dullness in new business, with some foundries now covered well into next year.

**St. Louis** — Melters are covered on fourth quarter needs, and new business has virtually halted, but shipments continue to increase. September deliveries were 30 per cent


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ahead of August, with another substantial gain indicated for October. Foundry operations are expanding more than the seasonal amount, with automotive casting demand improved markedly the past three weeks.

**Toronto, Ont.** — Merchant pig iron sales continue steady with melters showing interest in forward delivery as well as spot requirements. During the past week a number of melters placed contracts for last quarter and inquiries indicate other fair buying on this account. Spot demand shows little change from the previous two weeks.

# Scrap

**Scrap Prices, Page 210**

**Pittsburgh** — Recent weakness in scrap has been alleviated by the removal of distress material from the market. A large interest, inactive in buying for a long period, has provided an outlet for railroad steel, while down-river mills have re-entered the market at prices which make No. 1 heavy melting steel $14.75 to $15.25, an advance of 25 cents. Railroad specialties are weaker in the absence of consumer demand, with the current market nominal at $16.50 to $17. No. 2 heavy melting steel continues $13.50 to $14.

**Cleveland** — Shipments on orders continue to be the feature of the iron and steel scrap markets. There are occasional hold-ups at some plants since scrap is moving freely from dealers' hands. Large consuming interests continue to use from inventories rather than make additional purchases.

**Chicago** — Scrap prices are easier here, heavy melting steel being off 50 cents a ton on the basis of dealer-broker trading. No. 1 steel now is quoted $12.50 to $13, compared with $13.50 on the last mill purchase. No. 2 and automotive steel also are down 50 cents. Quotations on other grades generally are nominal in the absence of trading.

**New York** — Scrap trading is listless, with an advance of 50 cents in machine shop turnings to $4 to $4.50, the only revision in domestic prices. New export business is lacking, although some accumulations are being made for shipment against contracts. Export prices are unchanged except for an increase in old compressed sheets to $9.

**Philadelphia** — Steelmaking scrap is up 50 cents on new business in the domestic market, with higher offering prices for export. No. 1 heavy melting steel now is $14.50 to $15, with brokers covering at the bottom of the range. No. 2 steel is $13 to $13.50. For export, $14 is being offered for No. 1 and $13 for No. 2, with premiums reported occasionally for choice lots. Cast scrap is strong at $16 to $16.50. Higher quotations are substantiated by the sale of 2500 tons of new compressed sheets by a district auto interest at a price equivalent to about $14.75, delivered the nearest mill.

**Buffalo** — Scrap is marking time here as dealers await a revival in consumer buying. Meanwhile prices are unchanged, with No. 1 heavy melting steel nominal at $14 to $14.50. A few small sales by dealers covering previous orders have been made at prevailing prices.

**Detroit** — Activity in scrap is dull, with prices unchanged and dealers undecided which way the market will turn. Quotations generally were maintained on automotive lists closed recently, but volume was not quite up to expectations. While the immediate outlook is uncertain, some opinion is for an upward movement the next few months.

**Cincinnati** — Dealers' buying prices on iron and steel scrap are down 25 cents. Mills show apathy toward further commitments until inventories are cut, and dealer activity is likewise curtailed.

**St. Louis** — In the absence of improved scrap demand from consumers, prices are lower here. Dealers have covered most of their old contracts, and offerings are heavier, resulting in some distress accumulations.

**Toronto, Ont.** — Firmer prices are developing in iron and steel scrap and local dealers have raised their buying price on heavy melting steel to $10 to $10.50 per gross ton, or $1 per ton above the former level. Other lines are firm and unchanged. Demand for iron continues specialized with principal call reported for heavy melting and machinery cast.

# Warehouse

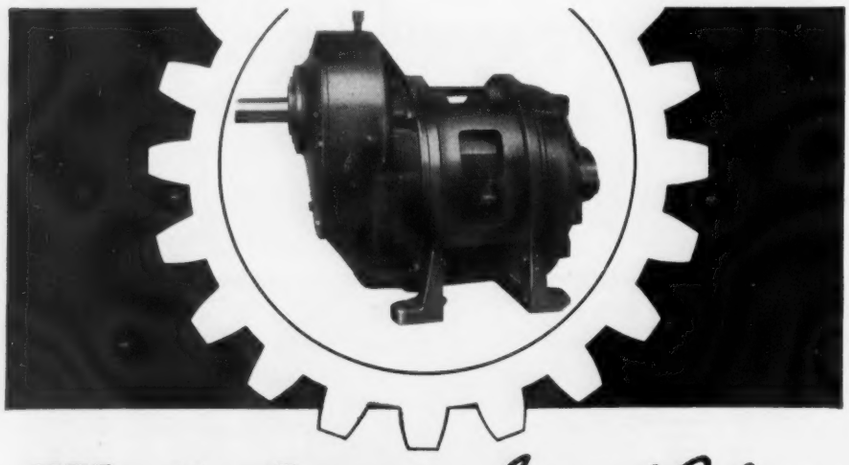
**Warehouse Prices, Page 209**

**Cleveland**—Warehouse shipments so far this month compare favorably with the September rate. Small gains are shown in number of orders, with individual purchases unchanged in size. A moderate increase in the total movement for October is anticipated.

**Chicago**—Most warehouses look for October to set a new peak for the year in sales, despite the fact September business was only slightly ahead of August. Country demand lately has been relatively more active than city sales.

**New York** — Effects of the truck-drivers' strike, recently settled, are noted by a slow start so far this month by most warehouses. Volume has not snapped back as expected, although orders are fairly numerous. Tonnage per shipment, however, is light, consumers buying only what is urgently needed.

**Philadelphia** — Business is more active in number of orders but tonnage shows only a slight gain over September. Specialty items, however, such as tool steel, show a 15



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to 20 per cent increase. Prices are steadier but still erratic.

**Buffalo** — While reports from warehouses vary, September business was the best for the year to date. Sales to consumers are slow to reflect the full extent of the upturn now being shown in mill operations. Some warehouses report better demand for heavy products.

**Cincinnati**—Sales so far in October hold about the rate a month ago when business scored a sizable gain over mid-summer volume. Except on reinforcing bars, prices are firm.

**St. Louis**—Improvement the past six weeks in warehouse sales continues, with individual orders the largest in a number of months.

# Steel in Europe

**Foreign Steel Prices, Page 209**

**London** — (*By Cable*)—Pig iron trade in Great Britain shows slight improvement, including export demand, but still is hand-to-mouth. Reduction in price is hoped for but is uncertain before the end of the year. The steel trade is slightly better, owing to severe restrictions on imports. The general feeling is that the markets are beginning to show signs of improvement.

The Continent reports export trade more active, especially to Scandinavia. Polish occupation of Teschen involves transfer to Poland of 75 per cent of Czechoslovakia's coal output and 50 per cent of its iron and steel output.

## Tin Plate

**Tin Plate Prices, Page 206**

**New York**—Tin plate consumers are buying on a hand-to-mouth basis, a practice expected to continue the greater part of this quarter, since buyers believe a price reduction likely when books are opened for the 1939 contracting season. Most buying currently is by smaller consumers, larger users having fair stocks. Export demand continues relatively light.

**Pittsburgh**—Tin plate activity is unchanged, with the slack season at hand for canmakers and requirements of other consumers steady. Buying is expected to continue slow until 1939 contracts are drawn and the price situation definitely clarified.

## Bolts, Nuts, Rivets

**Bolt, Nut, Rivet Prices, Page 207**

Bolt, nut and rivet makers look for recovery in business this month, following a moderate setback in September. Automotive and railroad requirements are counted on for some improvement, while better activity among farm equipment builders also is in prospect. Occasional gains in demand from miscellaneous users have been noted recently. Rehabilitation work in storm-ridden areas of the East is providing a moderate amount of business. Bolt and nut prices are somewhat irregular, particularly in the jobber market, while there has been a steadier trend in the industrial trade.

# Iron Ore

**Iron Ore Prices, Page 210**

**Cleveland**—Shipments of iron ore from upper lake ports during September amounted to 3,284,800 tons, against 9,173,991 tons in the same month last year, or a decrease of 64.2 per cent. The September shipments were also below the 3,325,715 tons brought down during August. Shipments for the year to Oct. 1 amounted to 14,157,290 tons, a decrease of 74 per cent from the 54,612,122 tons shipped during the comparable period last year.

Shipments for the season to Oct. 1 in 1938 and 1937, as tabulated by the Lake Superior Iron Ore association, follow:

| Port | To Oct. 1, 1938 | To Oct. 1, 1937 |
|---|---|---|
| Escanaba | 750,378 | 2,577,443 |
| Marquette | 775,847 | 4,332,207 |
| Ashland | 1,472,840 | 4,858,447 |
| Superior | 5,174,112 | 19,262,912 |
| Duluth | 3,046,122 | 14,861,920 |
| Two Harbors | 2,937,991 | 8,719,193 |
| Total | 14,157,290 | 54,612,122 |

## Pittsburgh Steel Second To Get Ledloy License

■ Pittsburgh Steel Co., Pittsburgh, has received a license from Inland Steel Co., Chicago, to produce its new lead-bearing steels. Carnegie-Illinois Steel Corp. had been granted a license earlier.

Inland first announced the lead-bearing steel last May, under the trade name of Ledloy. It has been produced by Inland in hot-rolled form and has been cold finished by a number of cold drawing concerns.

## Tool Engineers To Meet in Pittsburgh

■ American Society of Tool Engineers will hold its semiannual meeting in Pittsburgh Oct. 14-15. Dr. L. W. Chubb, director of research, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., will speak on "Industrial Advancement Through Scientific Research." James R. Weaver, director of manufacturing equipment, Westinghouse Electric & Mfg. Co., is committee chairman.

## Expect Steel Wages Report This Week

■ Thomas Holland, chairman, public contracts board, stated late last week that the board is nearing its conclusions on steel wages and recommendations will go to Secretary of Labor Perkins "within next few days." He indicated this might happen during the week of Oct. 10.

# Ingots Up 4.3% In September

■ SEPTEMBER steel ingot production totaled 2,657,748 gross tons, compared with 2,546,988 tons in August, an increase of 4.3 per cent, according to the American Iron and Steel institute. For nine months this year output was 18,005,938 tons, compared with 42,482,597 tons in the comparable portion of 1937.

Average weekly production in September was 620,969 tons, in August 574,941 tons. In September, 1937, it was 1,002,221 tons. Per cent of capacity engaged in September was 46.28, in August 42.85. Average of STEEL's weekly estimates for September was 45.44 per cent, varying only 0.84 per cent from actual performance.


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## Grease Institute Elects Officers at Convention

■ M. R. Bower, Standard Oil Co. of Ohio, Cleveland, was elected president of the National Lubricating Grease institute at the sixth annual convention of the organization at Hotel Stevens, Chicago, Oct. 3-4. E. V. Moncrieff, Swan & Finch Corp., New York, was named vice president, and F. J. Snyder, Fisk Bros. Refining Co., Newark, N. J., secretary-treasurer. G. W. Miller, Master Lubricants Inc., Buffalo, was reelected executive secretary.

The board of directors for the ensuing year includes: J. R. Battenfeld, Battenfeld Grease & Oil Corp., Kansas City, Mo.; W. E. Callaghan, Motor State Oil & Grease Co., Jackson, Mich.; M. B. Chittick, Pure Oil Co., Chicago; J. R. Corbett, Kato Grease & Oil Corp., Omaha, Neb.; C. B. Karns, Standard Oil Co. of New Jersey, Pittsburgh; F. C. Kerns, Texas Co., New York; L. P. Lochridge, Sinclair Refining Co., New York; W. H. Oldacre, D. A. Stuart Oil Co., Chicago; R. P. Patch, E. F. Houghton & Co., Philadelphia; W. H. Saunders Jr., International Lubricants Corp., New Orleans; F. J. Snyder, Fisk Bros. Refining Co., Newark, N. J.; and H. F. Wilhelm, Socony-Vacuum Oil Corp., New York.

A report of the technical phases of the convention will be presented in the Oct. 17 issue of STEEL.

## Auto Output Rises

■ Autmobile production for the week ended Oct. 8 was 37,665, compared with 25,405 in the preceding week, according to *Ward's Reports*. Comparisons:

| | Week ended Oct. 8 | Oct. 1 |
|---|---|---|
| General Motors | 17,330 | 8,725 |
| Chrysler | 10,900 | 8,800 |
| Ford | 2,115 | 615 |
| All others | 7,320 | 7,265 |

Monthly and yearly comparisons will be found on page 62.

## Westinghouse Pays Half Total Income to Workers

■ In the nine years from 1929 to 1937, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., had total income of $1,261,313,000, according to a statement to employes, stockholders and others by A. W. Robertson, chairman.

Nearly half this amount, $589,091,-

## Steel Ingot Statistics

Monthly Production—Complete for Bessemer; Open Hearth, Calculated from Reports of Companies Making 98.29 per cent in 1936

| 1938 | —Open Hearth— Gross tons | Per cent of capacity | —Bessemer— Gross tons | Per cent of capacity | — Total — Gross tons | Per cent of capacity | Weekly production, all companies, gross tons | Number of weeks in month |
|---|---|---|---|---|---|---|---|---|
| Jan. | 1,632,773 | 30.25 | 99,991 | 18.27 | 1,732,764 | 29.15 | 391,143 | 4.43 |
| Feb. | 1,578,233 | 32.38 | 125,493 | 25.40 | 1,703,726 | 31.74 | 425,931 | 4.00 |
| March | 1,854,669 | 34.36 | 157,737 | 28.83 | 2,012,406 | 33.85 | 454,268 | 4.43 |
| April | 1,793,522 | 34.31 | 131,644 | 24.84 | 1,925,166 | 33.44 | 448,757 | 4.29 |
| May | 1,676,215 | 31.06 | 130,590 | 23.87 | 1,806,805 | 30.39 | 407,857 | 4.43 |
| June | 1,519,589 | 29.07 | 118,688 | 22.40 | 1,638,277 | 28.46 | 381,883 | 4.29 |
| July | 1,854,076 | 34.43 | 127,982 | 23.44 | 1,982,058 | 33.42 | 448,429 | 4.42 |
| Aug. | 2,350,199 | 43.54 | 196,789 | 35.97 | 2,546,988 | 42.85 | 574,941 | 4.43 |
| Sept. | 2,449,861 | 46.98 | 207,887 | 39.32 | 2,657,748 | 46.28 | 620,969 | 4.28 |
| 9 mos. | 16,709,137 | 35.17 | 1,296,801 | 26.92 | 18,005,938 | 34.41 | 461,691 | 39.00 |
| 1937 | | | | | | | | |
| Jan. | 4,426,227 | 84.07 | 292,209 | 54.38 | 4,718,436 | 81.32 | 1,065,110 | 4.43 |
| Feb. | 4,083,070 | 85.89 | 331,629 | 68.34 | 4,414,699 | 84.27 | 1,103,675 | 4.00 |
| March | 4,814,926 | 91.45 | 403,400 | 75.07 | 5,218,326 | 89.94 | 1,177,952 | 4.43 |
| April | 4,682,084 | 91.83 | 388,783 | 74.71 | 5,070,867 | 90.25 | 1,182,020 | 4.29 |
| May | 4,769,238 | 90.59 | 382,671 | 71.21 | 5,151,909 | 88.79 | 1,162,959 | 4.43 |
| June | 3,900,108 | 76.50 | 284,615 | 54.69 | 4,184,723 | 74.48 | 975,460 | 4.29 |
| July | 4,220,848 | 80.10 | 335,456 | 62.56 | 4,556,304 | 78.48 | 1,030,838 | 4.42 |
| Aug. | 4,504,567 | 85.29 | 373,259 | 69.46 | 4,877,826 | 83.83 | 1,101,089 | 4.43 |
| Sept. | 4,021,035 | 78.80 | 268,472 | 51.71 | 4,289,507 | 76.30 | 1,002,221 | 4.28 |
| 9 mos. | 39,422,103 | ..... | 3,060,494 | ..... | 42,482,597 | ..... | 1,089,297 | 39.00 |
| Oct. | 3,204,209 | 60.67 | 188,715 | 35.12 | 3,392,924 | 58.31 | 765,897 | 4.43 |
| Nov. | 2,040,480 | 39.90 | 113,885 | 21.88 | 2,154,365 | 38.23 | 502,183 | 4.29 |
| Dec. | 1,386,188 | 26.31 | 86,833 | 16.19 | 1,473,021 | 25.37 | 333,263 | 4.42 |
| Total | 46,052,980 | 74.20 | 3,449,927 | 54.54 | 49,502,907 | 72.38 | 949,423 | 52.14 |

Percentages of capacity operated for 1938 are calculated on weekly capacities of 1,218,342 gross tons of open-hearth ingots and 123,514 gross tons of bessemer ingots, total 1,341,856 gross tons; based on annual capacities as of Dec. 31, 1937, as follows: Open-hearth ingots, 63,524,356 gross tons; bessemer ingots, 6,440,000 gross tons.

Percentages of capacity for the first six months of 1937 are calculated on weekly capacities of 1,188,452 gross tons for open-hearth ingots, 121,308 tons for bessemer and 1,309,760 tons total, based on annual capacities as of Dec. 31, 1936, as follows: Open-hearth ingots, 61,965,862 gross tons; bessemer, 6,325,000 tons; beginning July 1, 1937, on weekly capacities of 1,192,182 gross tons open-hearth ingots and 121,308 gross tons bessemer, total 1,313,490 gross tons; based on annual capacities as follows: Open-hearth ingots, 62,160,362 gross tons; bessemer, 6,325,000 gross tons.

000 was paid to employes in wages and salaries. An additional $15,253,000 went to employes through group insurance and payments to the employe annuity fund.

Stockholders received only $35,146,000, or 5.2 per cent. Tax collectors took $42,292,000. Materials, supplies, fuel, transportation and other expenses amounted to $491,112,000 in the 9-year period.

## Nonferrous Metals

**New York** — Nonferrous metal markets strengthened as trading progressed last week with copper and tin advancing rather sharply in line with higher prices abroad. Demand was heavy abroad and active here on the release of orders which had been delayed pending the outcome of the European crisis and on the improved business outlook. Some speculative buying in foreign metal markets developed on the strength in Wall street.

**Copper**—All first hands advanced prices ⅛-cent on both Wednesday and Thursday to the basis of 10.62½c, Connecticut, for electrolytic. Allied products prices advanced proportionately. Refiners lifted red metal scrap bids to the basis of 9.12½c for No. 1 heavy copper. Export was quoted around 10.75c, c.i.f. The rise abroad which preceded advances here was attributed partly to heavy demand for armament purposes by Japan and European countries.

**Lead** — Prices held at 4.95c, East St. Louis, on moderate buying. The strong undertone was supported by higher prices in London.

**Zinc** — Prime western firmed at 4.95c, East St. Louis, on the advance in the galvanized sheet rate to a new high for the year, another sharp reduction in slab zinc stocks, and the upward price trend in London.

**Tin** — Straits spot jumped to around 45.00c as standards in London crossed the £200 mark for the first time this year. Demand was active in London.

**Antimony** — American spot advanced ¼-cent to 11.75c, New York, although buying was mostly for case lots. Chinese held nominally unchanged.

# Equipment

**Boston** — Domestic buying of machine tools has declined slightly with a substantial number of inquiries to be closed. Builders have booked little business with the automobile industry for new models and most buying by the airplane industry appears to have halted temporarily. Foreign orders continue numerous, one shop in the Worcester district booking $175,000 in grinding machine business last month. Those with foreign order backlogs are generally active, working two 40-hour shifts in some instances. Portsmouth, N. H., navy yard closes bids Oct. 14 on five horizontal boring and milling machines, one hydraulic metal shaper and a 20-inch heavy duty shaper.

## Nonferrous Metal Prices

*Spot unless otherwise specified. Cents per pound*

| Oct. | Copper Electro, del. Conn. | Copper Lake, del. Midwest | Copper Casting, refinery | Straits Tin. New York Spot | Straits Tin. New York Futures | Lead N. Y. | Lead East St. L. | Zinc St. L. | Aluminum 99% | Antimony Amer. Spot, N.Y. | Nickel Carbonodes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.37½ | 10.50 | 9.90 | 44.30 | 44.60 | 5.10 | 4.95 | 4.95 | 20.00 | 11.75 | 35.00 |
| 3 | 10.37½ | 10.50 | 9.90 | 43.62½ | 43.85 | 5.10 | 4.95 | 4.95 | 20.00 | 11.75 | 35.00 |
| 4 | 10.37½ | 10.50 | 9.90 | 43.50 | 43.75 | 5.10 | 4.95 | 4.95 | 20.00 | 11.75 | 35.00 |
| 5 | 10.50 | 10.62½ | 10.02½ | 43.80 | 44.00 | 5.10 | 4.95 | 4.95 | 20.00 | 11.75 | 35.00 |
| 6 | 10.62½ | 10.75 | 10.15 | 45.00 | 45.20 | 5.10 | 4.95 | 4.95 | 20.00 | 12.00 | 35.00 |

**MILL PRODUCTS**

*F.o.b. mill base, cents per lb. except as specified. Copper brass products based on 10.62½c Conn. copper*

**Sheets**

Yellow brass (high) ..... 17.12½
Copper, hot rolled ..... 18.75
Lead, cut to jobbers ..... 8.25
Zinc, 100 lb. base ..... 9.75

**Tubes**

High, yellow brass ..... 19.87½
Seamless copper ..... 19.25

**Rods**

High yellow brass ..... 13.00
Copper, hot rolled ..... 15.25

**Anodes**

Copper, untrimmed ..... 16.00

**Wire**

Yellow brass (high) ..... 17.37½

**OLD METALS**

*Nom. Del. buying prices*

**No. 1 Composition Red Brass**

New York ..... 6.62½-6.75
Cleveland ..... 7.50-7.62½
Chicago ..... 6.50-6.75
St. Louis ..... 6.25-6.75

**Heavy Copper and Wire**

New York, No. 1 ..... 8.12½-8.37½
Cleveland, No. 1 ..... 8.12½-8.37½
Chicago, No. 1 ..... 8.12½-8.37½
St. Louis ..... 8.12½-8.37½

**Composition Brass Borings**

New York ..... 5.87½-6.12½

**Light Copper**

New York ..... 6.62½-6.87½
Cleveland ..... 6.62½-6.75
Chicago ..... 6.62½-6.87½
St. Louis ..... 6.50-6.62½

**Light Brass**

Cleveland ..... 4.12½-4.37½
Chicago ..... 4.50-4.75
St. Louis ..... 4.37½-4.62½

**Lead**

New York ..... 4.00-4.25
Cleveland ..... 3.75-4.00
Chicago ..... 4.00-4.12½
St. Louis ..... 3.75-4.00

**Zinc**

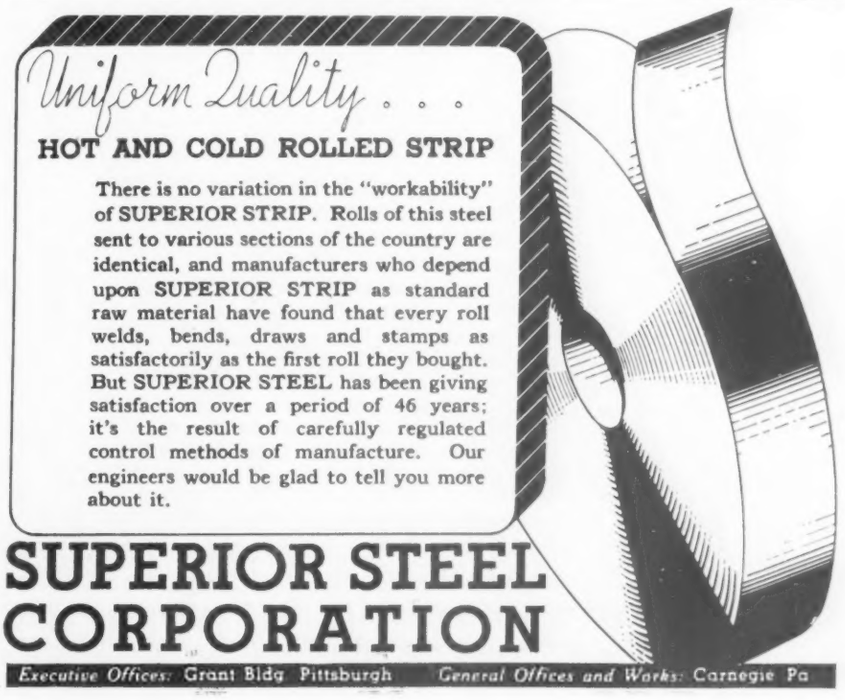
New York ..... 2.50-2.62½
Cleveland ..... 2.50-2.75
St. Louis ..... 2.75-3.00

**Aluminum**

Borings, Cleveland ..... 6.25-6.50
Mixed, cast, Cleveland ..... 8.75-9.00
Clips, soft, Cleveland ..... 13.25-13.50
Mixed cast, St. Louis ..... 8.25-8.50

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads, 11.12½
Standard No. 12 aluminum ..... 13.75-14.25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# Construction and Enterprise

### Ohio

ATTICA, O.—REA has made allotment of $238,000 to North Central Farm Bureau Electric Co-operative Inc., R. J. Williams, municipal light plant building, superintendent, for power line construction totaling 226 miles.

BELLEFONTAINE, O. — City, John Thatcher, service director, takes bids due about Oct. 17 for $209,000 expansion of sewage disposal plant; equipment to be installed includes two primary grease removal tanks, 250-foot sludge digestion tanks, trickling filters, settling tanks, glass-covered sludge drying beds and screening grinder. Consulting engineer, Floyd Browne, Marion, O.

BOWERSTON, O.—Village, Paul Price, clerk, approved bond issue, is completing specifications, and will be ready for bids soon on waterworks costing $54,500, and including wells, reservoir, pumping station and pipe lines. PWA has allotted $25,456 on project. George Reese, Canton, O., engineer. (Noted Aug. 22.)

CINCINNATI — City, C. O. Sherrill, manager, is taking bids to be due about Oct. 20 on waterworks project which will cost $218,300. A. S. Hibbs, superintendent of waterworks. (Noted July 18.)

CLEVELAND—Dill Mfg. Co. is taking bids for a four-story, 50 x 60-foot addition to its factory; cost estimated at $50,000. Roberts Wright Co., Swetland building, Cleveland, architect.

COLUMBUS GROVE, O.—PWA has allotted grant to village, Roy McCullough, mayor, for power plant improvements amounting to $32,571. Plans being prepared for work, consisting of removal of three old boilers and replacement by two new ones, and bids will be accepted Oct. 20. Consultant, Carl Simon, Van Wert, O.

DAYTON, O.—United States army air corps, materiel division, contracting officer, Wright field, will take bids until 10 a.m., Oct. 12, on 48 quick-action drill vises, circular 39-208; and 20 portable 110-volt sanders, circular 39-209.

FOREST, O. — Village, Leon Hume, mayor, is accepting bids until noon, Oct. 14, on improvements and extensions in its water softening plant and distribution system amounting to about $31,000. Consulting engineers, Champe, Finkbeiner & Associates, Toledo, O.

FRAZEYSBURG, O. — Village, E. W. Conner, mayor, proposes to construct waterworks and extend its distribution system at total cost of $60,000; plans nearly complete. Application filed with PWA for loan and grant, with bonds to be issued for balance. Arnold, Rosch & Hartline, 116 Fair avenue, New Philadelphia, O., consulting engineers.

GAMBIER, O.—Village, H. C. Parker, mayor, has approved bond issue for sewage system and treating plant to cost about $60,000; PWA application on file. Consulting engineer, Paul Uhlmann, Columbus, O.

LANCASTER, O.—City approved bond issue and has received PWA grant on construction of sewers and sewage treatment plant costing $708,150. Walter W. Graf, city engineer. (Noted Sept. 12.)

LORAIN, O.—City, Paul Mikus, service director, plans waterworks improvements costing above $115,000; project provides water tunnel, steam turbine pump, waterlines and boiler repairs. Application filed for PWA grant. Walker & Weeks, Cleveland, consultants.

MARYSVILLE, O. — City, George Scheiderer, clerk, contemplates erection of light and power plant to cost above $250,000. Will apply for PWA grant on project.

MIDVALE, O.—Village, C. O. Virtue, mayor, has plans nearly completed and will probably ask for bids soon on construction of waterworks and distribution system to cost $56,363; application filed for PWA grant. Balance available. Arnold, Rosch & Hartline, 116 Fair avenue, New Philadelphia, O., consulting engineer.

NEW STRAITSVILLE, O.—Village, W. J. Johnson, mayor, submits bond issue to voters Nov. 8 to finance construction of proposed waterworks costing $45,000. WPA aid is being sought in project.

PAULDING, O. — Paulding-Putnam Electric Co-operative Inc., V. E. Patterson, superintendent, has been allotted $308,000 by REA to construct 310 miles rural power transmission lines in five Ohio and Indiana counties.

PORT CLINTON, O.—Village, Otto Heineman, clerk of board of trustees, is taking bids at noon, Oct. 17, for improvements in its waterworks system, at cost of $100,000. Harry Smith is city engineer.

POWHATAN POINT, O.—Village, John Goodhue, mayor, has received approval of PWA grant for construction of waterworks to cost $82,432, and will advertise for bids during week of Oct. 17. Carl Simon, Van Wert, O., consulting engineer. (Noted Sept. 5.)

REPUBLIC, O.—Village, C. E. Womer, mayor, plans to construct waterworks system to cost $54,000; has approved bond issue and applied to PWA for allotment. Consulting engineers, Champe, Finkbeiner & Associates, Toledo, O., are preparing plans.

WARREN, O.—Trumbull Metal Products Co. has incorporated with stock of $25,000 to be issued. Will deal in metal products and fabricate steel and alloys. Guarnieri & Secrest, Warren, company attorneys.

WILLARD, O.—Village, E. L. Wolff, mayor, is completing plans and awaiting PWA grant for constructing sewers and sewage treatment plant costing $130,909; voters approved $72,000 bond issue. Jennings & Lawrence Co., Columbus, O., consulting engineer.

### Maine

PORTLAND, ME. — Pocahontas Fuel Co., Statler building, Boston, has approved plans for steam power house costing $45,000 to be erected at its plant here. Fay, Spofford & Thorndike, Boston, consulting engineers. (Noted Aug. 29.)

### New York

CARTHAGE, N. Y.—Carthage Paper Makers is letting separate contracts for equipment and addition to its power plant to cost $90,000. Gannett, Eastman & Fleming, Harrisburg, Pa., engineers.

NEW YORK—Willows Mfg. Corp. has been formed to manufacture tools and machinery by Benjamin Machinist, 90 161st street, Jamaica, N. Y. Capital is 200 shares no par stock.

OSWEGO, N. Y. — Niagara Hudson Power Co., 15 Broad street, New York, will take bids soon for construction of steam plant, marine work and transmitting lines in West harbor. Cost of project estimated at $7,250,000.

### New Jersey

LAKELAND, N. J.—Board of freeholders, Camden county, F. W. George, clerk, Camden county courthouse, plans construction of central power plant at mental hospital; project will cost $336,221. Perring & Remington, Camden, N. J., consulting engineers.

PAULSBORO, N. J.—Socony-Vacuum Oil Co. Inc., 26 Broadway, New York, proposes to install motors and controls, switch-gears and regulators in connection with rebuilding portion of oil refinery recently destroyed by fire at loss of about $500,000.

### Michigan

FLINT, MICH.—City, J. R. Pollock, manager, contemplates construction of

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municipal light and power plant; will place bond issue on ballot Nov. 8, if PWA extends application period.

### Illinois

CHICAGO—Clorox Chemical Co. takes bids for a three-story factory and office building to cost $300,000. C. F. Morrison, 221 North LaSalle street, Chicago, is architect in charge.

### Indiana

ANGOLA, IND.—PWA has approved grant to the city, Henry Wolfe, clerk, on construction of water softening plant costing $42,000; owner's share arranged for. Consulting engineer, E. C. Hurd & Son, Indianapolis.

### Kentucky

MAYSVILLE, KY. — City is seeking PWA grant to construct waterworks estimated to cost $600,000; D. B. Coughlin, city attorney.

### Florida

ARCADIA, FLA.—City will vote Oct. 18 on proposal to build $217,000 municipal power plant. (Noted Aug. 15.)

HOLLY HILL, FLA.—Town, A. D. Littlefield, mayor, plans construction of water supply system and has applied to PWA for loan and grant totaling $44,000.

JACKSONVILLE, FLA.—United States Gypsum Co. has let general contract for construction of its plant to George A. Fuller Co., Munsey building, Washington. (Noted Sept. 19.)

NICEVILLE, FLA.—City, J. M. Reynolds, mayor, has voted to issue $80,850 revenue debentures as its share of proposed cold storage plant and waterworks system. (Noted Sept. 26.)

SARASOTA, FLA.—PWA has approved grant to city on construction of projected water plant and main extensions to cost $138,000.

### Georgia

CUMMING, GA.—City, Roy Otwell, mayor, takes bids Oct. 13 for waterworks to cost $24,000. Engineer, J. B. McCrary Co., Atlanta, Ga.

### Mississippi

CLARKSDALE, MISS.—City will improve electric power plant building and install two 600-horsepower boilers at estimated total cost of $186,000; has PWA grant of $83,700. (Noted Sept. 19.)

PASCAGOULA, MISS.—City has PWA grant and loan for extensions and improvements in its waterworks, including wells, pump houses, storage tank, water mains and pumping equipment, costing about $96,000.

### North Carolina

HENDERSON, N. C.—City plans to construct a sewage disposal plant and voters have approved bond issue of $55,000 to match $45,000 PWA grant.

LINCOLNTON, N. C. — Town, E. M. Browne, mayor, is now accepting bids for constructing water lines, sewers, steel tank, disposal plant; $53,000 available for project. W. K. Dickson, Charlotte, N. C., engineer.

NEW BERN, N. C.—City will ask for bids soon on improvements in its municipal power plant and water station, including purchase of considerable equipment, total cost being $370,000. (Noted Sept. 12.)

OAKBORO, N. C.—City is planning to construct waterworks and will probably be ready for bids within three weeks. Paul Van Camp, Southern Pines, N. C., is engineer for the project.

SILER CITY, N. C. — City proposes construction of $40,000 sewage disposal plant and will vote on bonds Oct. 25; PWA has approved $28,000 grant.

### South Carolina

GREENVILLE, S. C. — PWA has approved grant and loan to city for waterworks improvements estimated to cost $1,867,000.

LAURENS, S. C.—Voters have approved bond issue of $40,000 for construction of proposed sewage disposal plant and extension of sewerage system.

### Tennessee

BROWNSVILLE, TENN. — City voters approved issuance of $104,000 bonds for either building or purchasing distributing system to resell TVA current. (Noted Sept. 12.)

CHATTANOOGA, TENN. — Chattanooga Electric Power board, S. R. Finley, general manager, has approved plans and will ask for bids soon on installation of overhead electric distribution system costing $250,000.

COLUMBIA, TENN.—City has awarded general contract of $221,657 for erection of electric distribution system to Fritz Zeibarth, Omaha, Nebr. (Noted Sept. 12.)

KNOXVILLE, TENN. — Tennessee valley authority will take bids to Oct. 17 for installing 64,000-kilovolt generator at Hiwassee power plant.

KNOXVILLE, TENN. — City has applied to PWA for $450,000 grant on $1,000,000 project to modernize and improve recently acquired municipal power plant. Max Bartlett, plant engineer.

MEMPHIS, TENN.—City light and water commission receives bids Oct. 20 for construction of power substation building costing $120,000.

MUMFORD, TENN.—City, Cato Ellis, mayor, received PWA grant of $11,000, and has voted approval of $12,000 bond issue for construction of municipal light and power plant.

### Virginia

SOUTH HILL, VA.—City plans construction of power plant and has voted bond issue of $82,500 to finance project.

### Missouri

BRAYMER, MO.—City has plans underway for construction of overhead distribution system, street lighting system and power plant housing two 150-kilowatt diesel electric units; estimated cost $35,450. PWA has approved grant on project.

CARUTHERSVILLE, MO. — PWA has approved grant and city is completing arrangements to issue bonds financing proposed municipal electric light and power plant estimated to cost $175,000, complete with distribution lines. Burns & McDonnell Engineering Co., Kansas City, Mo., engineers. (Noted Aug. 1.)

COLE CAMP, MO.—City has received PWA allotment on construction of sewage system and disposal plant; voters approved $83,000 in bonds.

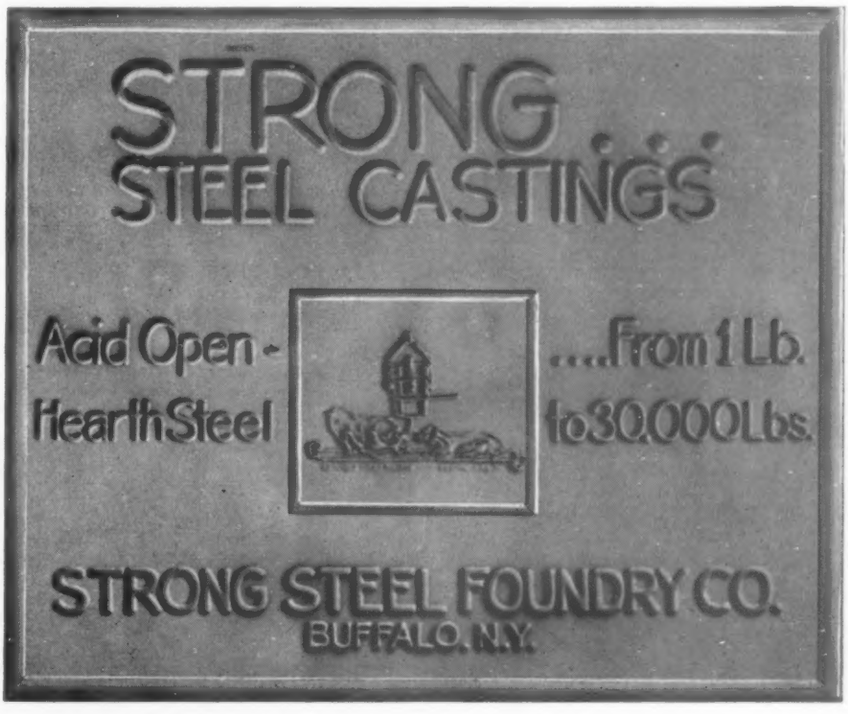
DEXTER, MO.—City will construct water treatment plant and install filter equipment at cost of $24,000; PWA allotment granted.

FERGUSON, MO. — Voters approved $125,000 bonds for sanitary sewer system and sewage disposal plant; city will apply to WPA for $600,000 grant to complete project.

MOBERLY, MO.—City plans improvements and equipment purchases for waterworks at cost of $32,000; PWA has allotted grant on work.

NEW LONDON, MO.—PWA has made grant to city of $25,000 for waterworks, well pump, pump house, chlorinator and distribution system to cost estimated $57,350.

WEST PLAINS, MO.—PWA has allotted grant of $74,000 to city for construction of diesel electric plant, 1400-kilowatt capacity, at cost of $166,000.



### Arkansas

CONWAY, ARK.—City, B. G. Wilson, mayor, proposes to spend $73,839 for purchase of 1000-horsepower diesel engine and generator for electric light plant; has applied for PWA grant on project.

### Oklahoma

FAIRVIEW, OKLA.—Fairbanks, Morse & Co., Kansas City, Mo., has been awarded contract at $49,485 for constructing electric light plant for city. E. M. Evans, Fairview, engineer.

PURCELL, OKLA.—City has PWA grant for proposed additions to its water system to facilitate fire-fighting. Will purchase equipment; total cost estimated at $32,000.

SAYRE, OKLA. — United Carbon Co. plans to expend $75,000 for improvements in its plant; will install duster system.

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### Minnesota

JACKSON, MINN.—REA has allotted $225,000 to the Federated Rural Electric association, Paul Ferguson, superintendent, to finance construction of 211 miles rural power transmitting lines in three counties. (Noted July 25.)

### Texas

BAIRD, TEX.—City has received PWA approval of loan and grant for construction of diesel generating plant and complete distributing system estimated to cost $165,000.

FLOYADA, TEX.—PWA has granted $90,000 to city on construction of diesel electric generating plant, distribution and lighting system; estimated cost, $150,000.

FREDERICKSBURG, TEX. — City has plans in progress for installing electrical distribution system; voters have approved $100,000 bonds to finance work. (Noted Sept. 19.)

HEMPSTEAD, TEX.—City has plans in progress for constructing water plant, $60,000 in bonds being available, with $32,000 grant approved by PWA. J. J. Rady, Fort Worth, Tex., consulting engineer.

HOUSTON, TEX.—B. F. Walker Co., 2910 Jensen drive, and Rowan Drilling Co., Sterling building, have jointly purchased acreage for erection of industrial warehouses.

HOUSTON, TEX. — Lee C. Moore & Co., 3229 Navigation building, Houston, manufacturer of oil field drilling equipment, has purchased 5-acre tract as site for prospective branch manufacturing plant.

ODESSA, TEX.—Barnsdall Refining Co., Tulsa, Okla., plans installation of motors and controls, air compressors and motor-driven pumping machinery in the rebuilding of its gasoline refining plant, recently damaged by fire and explosion to the extent of $400,000.

### Kansas

ANTHONY, KANS.—PWA has approved a grant to city, E. C. Miller, commissioner, in the construction of a sewage disposal plant costing $55,000. Black & Veatch, Kansas City, Mo., engineers.

ESKRIDGE, KANS.—PWA has made allotment to city, George Cook, clerk, for construction of $107,843 waterworks system; Paulette & Wilson, Salina, Kans., are consulting engineers. (Noted Aug. 22.)

LARNED, KANS.—City, G. F. Frizell, mayor, proposes improvements in its power plant, including installation of 1500-kilowatt turbine; cost estimated at $73,636. Black & Veatch, Kansas City, Mo., consulting engineers. (Noted July 25.)

SCRANTON, KANS.—PWA has allotted grant to the city in the proposed construction of waterworks to cost $53,181. Paulette & Wilson, Salina, Kans., engineers.

WELLINGTON, KANS. — City, C. E. Glamarn, mayor, is preparing final plans for a project providing improvements in power plant, including two steam boilers and water heaters; and improvements in waterworks, including filter extensions and settling basins. Total cost about $201,000. Black & Veatch, Kansas City, Mo., engineers. (Noted Aug. 15.)

### South Dakota

TYNDALL, S. DAK.—City, W. W. Byers, city auditor, will be ready for bids about Nov. 1 in the improvement of its power plant and waterworks; project provides installation of 300-horsepower diesel engine generator. Total cost is $40,488. Consulting engineer is H. S. Nixon, Omaha, Nebr. (Noted Oct. 3.)

### Iowa

ACKLEY, IOWA—City, W. J. Scourick, clerk, is taking bids to 10 a. m., Oct. 24, on the improvement of its light plant; project includes purchase and installation of 225-horsepower diesel engine with auxiliary equipment. Plans from consulting engineer, Ralph Gearhart, Cedar Rapids, Iowa; certified check 5 per cent to accompany bids. (Noted Aug. 22.)

MARCUS, IOWA—City, William Bass, mayor, has applied to PWA for a grant in the projected construction of a water supply system and iron-removal plant to cost $33,250. H. H. Henningsen Engineering Co., Omaha, Nebr., consultant.

MARION, IOWA—Linn County Rural Electric Co-operative association, Glenn Stoner, president, has been allotted $228,000 by REA for construction 206 miles of rural transmission lines in Linn county.

ROLFE, IOWA—City, John Brinkman, mayor, plans to erect municipal light plant and distribution system at cost of $99,000; application filed for PWA grant. Young & Stanley, Muscatine, Iowa, engineers.

### Colorado

COLORADO SPRINGS, COLO.—City proposes extensions in municipal hydroelectric power plant, including installation of 2500-kilowatt hydraulic turbine; cost approximately $470,000. F. O. Ray, city engineer.

### Pacific Coast

LOS ANGELES—Bureau of light and power has plans maturing for new steel tower transmission line from Boulder dam hydroelectric power development to the city, distance of 240 miles; work is to begin soon. Requires about 9,000,000 pounds of copper conductor and 1200 steel towers. Cost estimated at nearly $13,000,000.

LONGVIEW, WASH.—Cowlitz County Rural Electrification association will receive bids Oct. 29 for construction of a power substation, alternating 150 or 225 kilovolt-amperes.

SEATTLE—Occidental Sheet & Metal Co. Inc., 2106 Rainier avenue, has been organized with $20,000 capital by A. Snellenberg and associates.

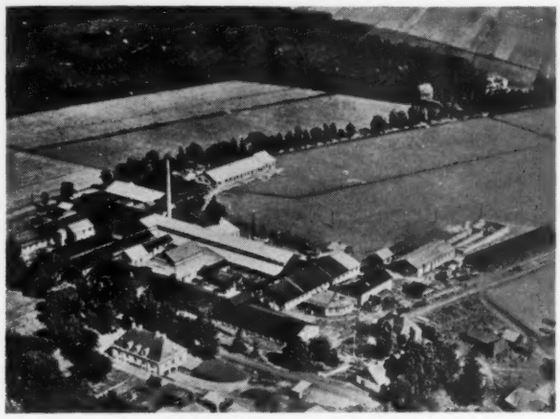
SHELTON, WASH.—Little Horn Mining Co. Inc., capital $50,000, has been formed by group headed by B. T. McGuire.

TACOMA, WASH.—City plans to purchase and install in light plant transformers for which it has $60,000 available.

### Canada

LEASIDE, ONT. — Cheney Chemicals Ltd., 180 Duke street, Toronto, plans to reconstruct plant here at approximate cost of $50,000.

PORT ARTHUR, ONT.—General Aircraft Co. Ltd., J. Dunkleman, general manager (c/o A. Cheesman, city hall, alderman), has purchased site for construction of planned $100,000 plant.



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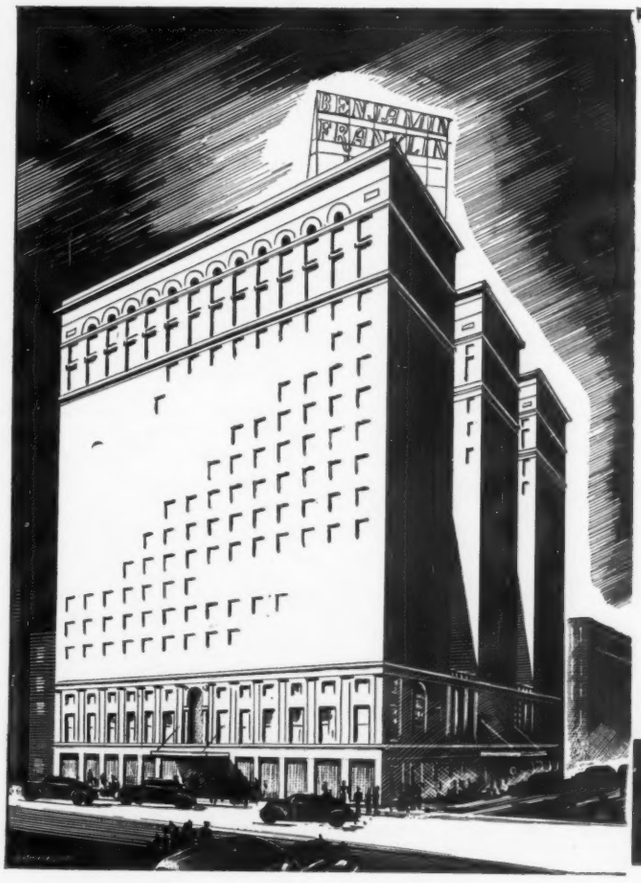


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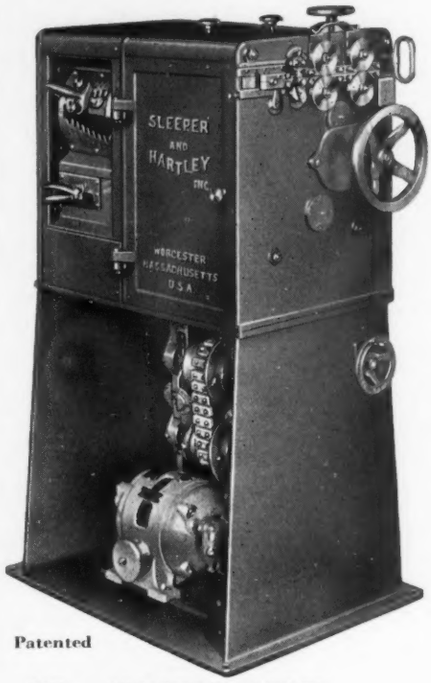


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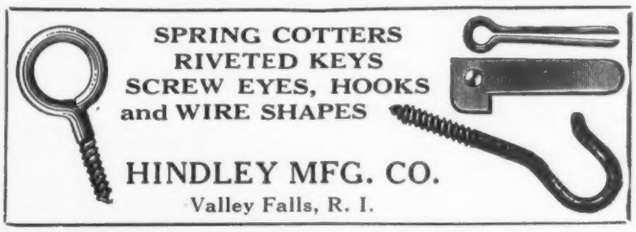

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Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., So. 10th and Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

**BOLTS (Stove)**
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

**BOLTS (Track)—See TRACK BOLTS**

**BORING MACHINES (Precision)**
Heald Machine Co., Worcester, Mass.

**BOX STRAPPING**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.

**BOXES (Annealing)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Petroleum Iron Works Co., The, Sharon, Pa.
Union Steel Casting Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

**BOXES (Case Hardening)**
Driver-Harris Co., Harrison, N. J.

**BOXES (Open Hearth Charging)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Morgan Engineering Co., The, Alliance, O.
Petroleum Iron Works Co., The, Sharon, Pa.

**BRACING (Carload)**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.

**BRAKE LININGS**
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

**BRAKES (Electric)**
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

**BRAKES (Hydraulic)**
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

**BRAKES (Magnetic)**
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**BRAKES (Press)**
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

**BRICK—(Insulating)—See INSULATING BRICK**

**BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.**

**BRICK (Acid Resisting)**
Keagler Brick Co., 443 W. Market St., Steubenville, O.

**BRICK (Silicon Carbide)**
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

**BRIDGE CRANES (Ore and Coal Handling—See CRANES (Bridge)**

**BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.**
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., 19 Rector St., New York City.
Belmont Iron Works, 22nd and Washington Ave., Philadelphia, Pa.
Blaw-Knox Co., Blawnox, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Petroleum Iron Works Co., The, Sharon, Pa.

**BROACHING MACHINES**
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

**BUCKETS (Clam Shell, Dragline Grab, Single Line)**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 Kilbourne Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.

**BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)**
Brosius, Edgar E., Inc., Sharpsburg, Pa.

**BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.**

**BULLDOZERS**
Beatty Machine & Mfg. Co., Hammond, Ind.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

# WHERE-TO-BUY

**BUNGS (Rubber)**
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

**BURNERS (Acetylene)—See TORCHES AND BURNERS**

**BURNERS (Automatic)**
American Gas Furnace Co., Elizabeth, N. J.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
North American Mfg. Co., The, 2910 E. 75th St., Cleveland, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

**BURNERS (Fuel, Oil, Gas, Combination)**
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., 19 Rector St., New York City.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
North American Mfg. Co., The, 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

**BURNERS (Fuel, Oil, Gas, Combination)—Cont.**
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

**BUSHINGS (Bronze)**
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

**BUSHINGS (Oilless)**
Rhoades, R. W., Metaline Co., 50 3rd St., Long Island City, N. Y.

**BUSINESS CARDS (Engraved)**
Modern Card Co., 1153 Fullerton Ave., Chicago, Ill.

**BY-PRODUCT PLANTS**
Koppers Co., Engineering and Construction Div., 1438 Koppers Bldg., Pittsburgh, Pa.

**CADMIUM**
Udylite Co., The, 1651 E. Grand Blvd., Detroit, Mich.

**CADMIUM PLATING PROCESS**
Udylite Co., The, 1651 E. Grand Blvd., Detroit, Mich.

**CALCIUM METAL AND ALLOYS**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

**CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)**

**CAR DUMPERS**
Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.

**CAR PULLERS and SPOTTERS**
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 Kilbourne Ave., Chicago, Ill.

**CARBIDE**
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.

**CARBURIZING**
Holden, A. F., Co., New Haven, Conn.

**CARLOAD BRACING—See BRACING (Carload)**

**CARS (Charging)**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Co., Pittsburgh-Chicago.
Morgan Engineering Co., The, Alliance, O.

**CARS (Industrial and Mining)**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Petroleum Iron Works Co., The, Sharon, Pa.

**CARS (Scale)**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

**CASE HARDENING**
Holden, A. F., Co., New Haven, Conn.

**CASTINGS (Acid Resisting)**
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., 67 Wall St., New York City.
Meehanite Metal Corp., Pittsburgh, Pa.
National Alloy Steel Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**CASTINGS (Alloy Steel)**
Babcock & Wilcox Co., 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Damascus Steel Casting Co., The, New Britain, Pa.
Electro-Alloys Co., The, Elyria, O.
National-Erie Corp., W. 15th and Raspberry Sts., Erie, Pa.
Pittsburgh Rolls Corp. 41st and Willow Sts., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell St., Chicago, Ill.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wilcox-Rich Corp., 9771 French Rd., Detroit, Mich.

**CASTINGS (Brass, Bronze, Copper, Aluminum)**
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Cramp Brass & Iron Foundries Co., Paschall Sta., Philadelphia, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Titan Metal Mfg. Co., Bellefonte, Pa.

**CASTINGS (Electric Steel)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Damascus Steel Casting Co., The, New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Fort Pitt Steel Casting Co., 3200 Walnut St., McKeesport, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.

**CASTINGS (Gray Iron, Alloy, or Semi-Steel)**
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Columbia Steel Co., San Francisco, Calif.
Cramp Brass & Iron Foundries Co., Paschall Sta., Philadelphia, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.


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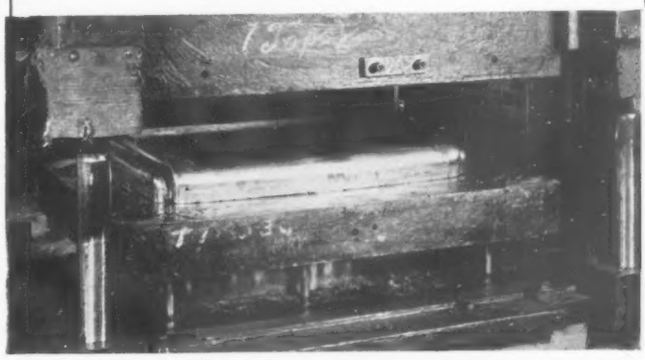

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**CASTINGS (Gray Iron, Alloy, or Semi-Steel)—Con.**
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewistown Foundry & Mach. Co., 16 W. Elizabeth St., Lewistown, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Murray Iron Works, Burlington, Iowa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango Penn Mold Co., Dover, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**CASTINGS (Heat Resisting)**
Driver-Harris Co., Harrison, N. J.
Electro-Alloys Co., The, Elyria, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
National Alloy Steel Co., Blawnox, Pa.
Shenango Penn Mold Co., Dover, O.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**CASTINGS (Malleable)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Erie Malleable Iron Co., W. 12th & Cherry Sts., Erie, Pa.
Jamestown Malleable Iron Corp., 500-700 Tiffany Ave., Jamestown, N. Y.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Peoria Malleable Castings Co., Peoria, Ill.

**CASTINGS (Manganese Steel)**
American Manganese Steel Co., Chicago Heights, Ill.
Damascus Steel Casting Co., The, New Brighton, Pa.

**CASTINGS (Steel)**
**(*Also Stainless)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Damascus Steel Casting Co., The, New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Fort Pitt Steel Casting Co., 3200 Walnut St., McKeesport, Pa.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Standard Steel Works Co., Burnham, Pa.
Strong Steel Fdy. Co., Hertel & Norris Ave., Buffalo, N. Y.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.

**CASTINGS (Wear Resisting)**
Meehanite Metal Corp., Pittsburgh, Pa.
Shenango Penn Mold Co., Dover, O.

**CASTINGS (Worm and Gear Bronze)**
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.

**CEMENT (Acid Proof)**
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

**CEMENT (High Temperature)**
Carborundum Co., The, Perth Amboy, N. J.
Norton Company, Worcester, Mass.
Quigley Company, Inc., 56 W. 45th St., New York City.

**CEMENT (Refractory, High Temperature)**
Johns-Manville Co., 22 E. 40th St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

**CENTRAL STATION EQUIPMENT**
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**CHAIN (Alloy Steel)**
McKay Co., The, 1005 Liberty Ave., Pittsburgh, Pa.

**CHAIN (Bundling)**
McKay Co., The, 1005 Liberty Ave., Pittsburgh, Pa.

**CHAIN (Draw Bench)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

**CHAIN (Industrial)**
McKay Co., The, 1005 Liberty Ave., Pittsburgh, Pa.

**CHAIN (Magnet)**
McKay Co., The, 1005 Liberty Ave., Pittsburgh, Pa.

**CHAIN (Malleable)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.

**CHAIN (Mining)**
McKay Co., The, 1005 Liberty Ave., Pittsburgh, Pa.

**CHAIN (Roller)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

**CHAIN (Sling)**
McKay Co., The, 1005 Liberty Ave., Pittsburgh, Pa.

**CHAIN (Sprocket)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Peoria Malleable Castings Co., Peoria, Ill.

**CHAIN (Steel-Finished Roller)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

**CHAIN (Welded or Weldless)**
McKay Co., The, 1005 Liberty Ave., Pittsburgh, Pa.

**CHAIRS (Steel)**
Harter Corp., The, Sturgis, Mich.

**CHARGING MACHINES (Cupola)**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

**CHARGING MACHINES (Open Hearth)**
Morgan Engineering Co., The, Alliance, O.

**CHARGING MACHINES AND MANIPULATORS (Autofloor Type)**
Brosius, Edgar E., Inc., Sharpsburg, Pa.

**CHECKER BRICK**
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.

**CHROME ORE**
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

**CHROMIUM METAL AND ALLOYS**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

**CLEANING SPECIALTIES**
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

**CHUCKS (Automatic Closing)**
Tomkins-Johnson Co., The Jackson, Mich.

**CLUTCH-BRAKES (Magnetic)**
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**CLUTCHES (Friction and Overrunning)**
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.

**CLUTCHES (Magnetic)**
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**COAL OR COKE**
Alan Wood Steel Co., Conshohocken, Pa.
Amtorg Trading Corp., Sujuzugleexport Div., 261 Fifth Ave., New York City.
Appalachian Coals, Inc., Transportation Bldg., Cincinnati, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Gas & Coke Div., The Koppers Co., Pittsburgh, Pa.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Coal Co., Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

**COAL, COKE, ORE AND ASH HANDLING MACHINERY**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., Koppers Bldg., Pittsburgh, Pa.
Koppers-Rheolaveur Co., Pittsburgh, Pa.

**COKE—See COAL OR COKE**

**COKE OVEN MACHINERY**
Alliance Machine Co., The, Alliance, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

**COKE OVENS (By-Product)**
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.

**COLUMBIUM**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

**COMBUSTION BULBS**
Norton Company, Worcester, Mass.

**COMBUSTION CONTROLS**
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.

**COMPENSATORS (Automatic)**
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

**COMPRESSORS (Air)**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Compressor Corp., Harrison, N. J.

**CONCRETE REINFORCING BARS—See BARS (Concrete Reinforcing)**

**CONDENSERS (Surface, Barometric, Multi-Jet)**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

**CONDUITS (Electric)**
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

**CONDUITS (Pressure-Treated Wood)**
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

**CONNECTING RODS**
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Burnham, Pa.
Transue & Williams Steel Forging Co., Alliance, O.

**CONTRACTORS—See ENGINEERS AND CONTRACTORS**

**CONTROL SYSTEMS (Automatic)**
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

**CONTROLS (Variable Speed)**
Reeves Pulley Co., Columbus, Ind.

**CONTROLLERS (Combustion)**
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.

**CONTROLLERS (Electric)**
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

**CONTROLS (Temperature)**
American Gas Furnace Co., Elizabeth, N. J.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

**CONVEYOR BELTS (High and Low Temperature)**
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

**CONVEYOR BELTS (Steel)**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.

**CONVEYOR BELTS (Wire)**
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

**CONVEYORS (Apron)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Logan Co., Franklin and Buchanan Sts., Louisville, Ky.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

**CONVEYORS (Chain)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Logan Co., Buchanan and Franklin Sts., Louisville, Ky.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

**CONVEYORS (Elevating)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Logan Co., Franklin and Buchanan Sts., Louisville, Ky.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

**CONVEYORS (Magnetic)**
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**CONVEYORS (Overhead Trolley)**
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

**CONVEYORS (Roller—Power and Gravity)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Logan Co., Franklin and Buchanan Sts., Louisville, Ky.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

**CONVEYORS (Wheel)**
Logan Co., Franklin and Buchanan Sts., Louisville, Ky.

**COPPER (Phosphorized)**
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

**COPPERING COMPOUND**
American Chemical Paint Co., Ambler, Pa.

**COTTER PINS**
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

**COUPLERS (Hose, Instantaneous—Air and Water)**
Hunt, C. B., & Son, Salem, O.

**COUPLERS (Valving, Safety—Air and Water)**
Hunt, C. B., & Son, Salem, O.

**COUPLINGS (Flexible)**
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett-Hayward Div., Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

**COUPLINGS (Pipe)**
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Republic Steel Corp., Dept. ST, Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

**CRANES, BRIDGE (Ore and Coal Handling)**
Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.

**CRANES (Charging)**
Alliance Machine Co., The, Alliance, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

**CRANES (Creeper, Erection)**
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

**CRANES (Electric)**
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

**CRANES (Gantry)**
Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cullen-Friestedt Co., 1308 Kilbourne Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Ohio Locomotive Crane Co., Bucyrus, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

**CRANES (Gasoline and Diesel)**
Cullen-Friestedt Co., 1308 Kilbourne Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

**CRANES (Hand)**
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

**CRANES (Jib)**
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

**CRANES (Locomotive)**
Cullen-Friestedt Co., 1308 Kilbourne Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O

**CRANES (Monorail)**
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

**CRANK SHAFTS**
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Transue & Williams Steel Forging Co., Alliance, O.
Union Drawn Steel Co., Massillon, O.

**CRUSHERS**
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.
Lewistown Foundry & Mach. Co., 16 W. Elizabeth St., Lewistown, Pa.

**CRUSHERS (Ring)**
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

**CUTTERS (Bar, Iron Hand)**
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

**CUTTERS (Die Sinking and End Milling)**
Tomkins-Johnson Co., The, Jackson, Mich.

**CUTTERS (Gang Slitter)**
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.
Tinker, F., & Son's Co., 57th & Butler Sts., Pittsburgh, Pa.

**CUTTING AND WELDING—See WELDING**

**CUTTING OILS—See Oils (Cutting)**

**CYLINDERS (Air and Hydraulic)**
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., The, Jackson, Mich.

**CYLINDERS (Pressure)**
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.

**DEGREASERS**
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

**DEOXIDIZERS**
Vanadium Corp. of America, 420 Lexington Ave., New York City.

**DIE BLOCKS**
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., 900 E. 67th St., Cleveland, O.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Burnham, Pa.

**DIE CASTINGS**
Titan Metal Mfg. Co., Bellefonte, Pa.

**DIE HEADS**
Landis Machine Co., Waynesboro, Pa.

**DIE-SINKING MACHINES**
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

**DIES (Cast)**
Advance Foundry Co., The, 100 Parnell Ave., Dayton, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Wilcox-Rich Corp., 9771 French Rd., Detroit, Mich.

**DIES (Punching, Stamping, Blanking)**
Columbus Die, Tool & Mach. Co., The, 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.

**DRILL RODS—See RODS (Drill)**

**DRILLING MACHINES (Multiple, Heavy Duty)**
Thomas Machine Mfg. Co., Pittsburgh, Pa.

**DRILLING MACHINES (Radial)**
Thomas Machine Mfg. Co., Pittsburgh, Pa.

**DRILLS (Portable—Pneumatic)**
Ingersoll-Rand Co., 11 Broadway, New York City.

**DRILLS (Twist)—See TWIST DRILLS**

**DRIVES (Chain)**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Simonds Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

**DRIVES (Cut Herringbone Gears)**
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

**DRIVES (Multi-V-Belt)**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

**DRIVES (Reciprocating)**
Ajax Flexible Coupling Co., Westfield, N. Y.

**DRUMS (Magnetic)**
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., The, 650 So. 28th St., Milwaukee, Wis.

**DRUMS (Steel)**
Petroleum Iron Works Co., The, Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.

**DRYERS (Compressed Air)**
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

**DUST ARRESTING EQUIPMENT**
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

**ECONOMIC SERVICE**
Brookmire Corp., 551 Fifth Ave., New York City.

**ECONOMIZERS**
Babcock & Wilcox Co., 19 Rector St., New York City.

**ELECTRIC WELDING—See WELDING**

**ELECTRIC WIRING—See WIRE AND CABLE**

**ELECTRICAL EQUIPMENT**
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

**ELEVATING AND CONVEYING MACHINERY—See CONVEYORS**

**ENGINEERS AND CONTRACTORS**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**ENGINEERS (Consulting)**
Aetna-Standard Engineering Co., The, Youngstown, O.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**ENGINEERS, CONSULTING (By-Product Coke Oven & Gas Plants)**
Koppers Co., Engineering and Construction Div., 1438 Koppers Bldg., Pittsburgh, Pa.

**ENGINES (Diesel)**
Cooper-Bessemer Corp., Mt. Vernon, O.

**ENGINES (Gas, Oil)**
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

**ENGINES (Steam)**
Murray Iron Works, Burlington, Iowa.
Oil Well Supply Co., Dallas, Texas.

**FACING MACHINES (Structural)**
Thomas Machine Mfg. Co., Pittsburgh, Pa.

**FANS (Portable)**
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

**FENCING (Wire)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Cyclone Fence Co., Waukegan, Ill.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Superior Iron & Wire Works, The, 39 Pride St., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

**FERROALLOY (Briquets)**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

**FERROALLOYS**
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Driver-Harris Co., Harrison, N. J.
Electro-Metallurgical Sales Corp., 30 E. 42nd St., New York City.
International Nickel Co., Inc., 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

**FERROCHROME**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America. 420 Lexington Ave., New York City.

**FERROMANGANESE**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

**FERROPHOSPHORUS**
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

**FERROSILICON**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

**FERROSILICON ALUMINUM**
Vanadium Corp. of America, 420 Lexington Ave., New York City.

**FERROTITANIUM**
Vanadium Corp. of America, 420 Lexington Ave., New York City.

**FERROVANADIUM**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

**FILES AND RASPS**
Nicholson File Co., Providence, R. I.

**FILTER CLOTH (Asbestos)**
Johns-Manville Co., 22 E. 40th St., New York City.

**FILTER CLOTH (Metallic)**
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.

**FLANGES (Welded Steel)**
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

**FLOOR ARMORING**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.

**FLOORING (Monolithic)**
Johns-Manville Co., 22 E. 40th St., New York City.

**FLOORING (Steel)**
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp., Machinery Div., Dravo Bldg., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son. Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Dravo Bldg., Pittsburgh, Pa.

**FLUE DUST CONDITIONERS**
Brosius, Edgar E., Inc., Sharpsburg, Pa.

**FLUOR SPAR**
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

**FLUXES (Soldering)**
American Chemical Paint Co., Ambler, Pa.
The Ruby Chemical Co., 56 McDowell St., Columbus, O.

**FORGING BILLETS—See BILLETS**

**FORGING MACHINERY**
Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

**FORGINGS, (Brass, Bronze, Copper)**
American Brass Co., The, 25 Broadway, New York City.
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

**FORGINGS (Drop) (*Also Stainless)**
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Oil Well Supply Co., Dallas, Texas.
Transue & Williams Steel Forging Co., Alliance, O.

**FORGINGS (Hollow Bored)**
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry St., Erie, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

**FORGINGS (Iron and Steel) (*Also Stainless)**
*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Oliver Iron & Steel Corp., S 10th and Muriel Sts., Pittsburgh, Pa.
Standard Steel Works Co., Burnham, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Transue & Williams Steel Forging Co., Alliance, O.

**FORGINGS (Upset)**
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Transue & Williams Steel Forging Co., Alliance, O.

**FROGS AND SWITCHES**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

**FURNACE INSULATION—See INSULATION**

**FURNACES (Blast)**
Bethlehem Steel Co., Bethlehem, Pa.
Brassert, H. A. Co., 310 So. Michigan Ave., Chicago, Ill.

**FURNACES (Electric Heating)**
Electric Furnace Co., The, Wilson St., Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 Highland Blvd., Milwaukee, Wis.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.

**FURNACES (Electric Melting)**
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Hagan, Geo, J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

**FURNACES (Forging)**
American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Wilson St., Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

**FURNACES (Galvanizing)**
Salem Engineering Co., 714 So. Broadway, Salem, O.
Spowers, W. H., Jr., 551 Fifth Ave., New York City.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

**FURNACES (Gas or Oil)**
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

**FURNACES (Industrial)**
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

**FURNACES (Laboratory)**
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 Highland Blvd., Milwaukee, Wis.

**FURNACES (Open Hearth)**
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.

**FURNACES (Recuperative)**
Electric Furnace Co., The, Wilson St., Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

**FURNACES (Sheet and Tin Mill)**
Aetna-Standard Engineering Co., The, Youngstown, O.
Electric Furnace Co., The, Wilson St., Salem, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

**FURNACES (Steel Mill)**
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Wilson St., Salem, O.
Flinn & Dreffein Co., 308 W. Washington St., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

**FURNACES (Steel Treating, Annealing, Case Hardening, Tempering)**
American Gas Furnace Co., Elizabeth, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Wilson St., Salem, O.
General Electric Co., Schenectady, N. Y.

**FURNACES (Steel Treating, Annealing, Case Hardening, Tempering) —Cont.**
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

**FURNACES (Galvanizing)**
Salem Engineering Co., 714 So. Broadway, Salem, O.
Spowers, W. H., Jr., 551 Fifth Ave., New York City.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

**FURNACES (Gas or Oil)**
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

**FURNACES (Industrial)**
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

**FURNACES (Laboratory)**
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 Highland Blvd., Milwaukee, Wis.

**FURNACES (Open Hearth)**
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.

**FURNACES (Recuperative)**
Electric Furnace Co., The, Wilson St., Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

**FURNACES (Sheet and Tin Mill)**
Aetna-Standard Engineering Co., The, Youngstown, O.
Electric Furnace Co., The, Wilson St., Salem, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

**FURNACES (Steel Mill)**
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Wilson St., Salem, O.
Flinn & Dreffein Co., 308 W. Washington St., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

**FURNACES (Steel Treating, Annealing, Case Hardening, Tempering)**
American Gas Furnace Co., Elizabeth, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Wilson St., Salem, O.
General Electric Co., Schenectady, N. Y.

**FURNACES (Steel Treating, Annealing, Case Hardening, Tempering) —Cont.**
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 Highland Blvd., Milwaukee, Wis.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

**FURNITURE (Steel)**
Angle Steel Stool Co., The, Plainwell, Mich.

**FURNITURE (Tubular Steel)**
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.
Harter Corp., The, Sturgis, Mich.

**GALVANIZING (Consulting)**
Spowers, W. H., Jr., 551 Fifth Ave., New York City.

**GALVANIZING (Hot Dip)**
Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Asso., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Chain Products Co., The, Cleveland, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., Philadelphia, Pa.
Thomas Gregory Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

**GALVANIZING BLANKETS (Dry)**
Gray Chemical Co., Roulette, Pa.

**GALVANIZING PLANTS (Designing)**
Spowers, W. H., Jr., 551 Fifth Ave., New York City.

**GALVANIZING PLANTS FOR SHEETS**
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

**GAS HOLDERS**
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., The, Sharon, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

**GAS PRODUCERS PLANTS**
Flinn & Dreffein Co., 308 W. Washington St., Chicago, Ill.
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

**GAS RECOVERY COKE OVEN AND GAS PLANTS**
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Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.

# WHERE-TO-BUY

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Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Koppers Co., Western Gas Div., Fort Wayne, Ind.

**GASKETS (Asbestos, Metal or Rubber)**
Johns-Manville Co., 22 E. 40th St., New York City.

**GAUGES (Indicating and Recording)**
General Electric Co., Schenectady, N. Y.

**GEAR BLANKS**
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Standard Steel Works Co., Burnham, Pa.
Waldron, John, Corp., New Brunswick, N. J.

**GEAR MACHINERY (Generating)**
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.

**GEARS (Non-Metallic)**
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

**GEARS (Spur, Bevel, Miter)**
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Simonds Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

**GEARS (Steel Laminated)**
Waldron, John, Corp., New Brunswick, N. J.

**GEARS (Worm)**
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Simonds Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

**GEARS AND GEAR CUTTING**
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Murray Iron Works, Burlington, Iowa.
Philadelphia Gear Works, Erie Ave. and G Sts., Philadelphia, Pa.
Simonds Mfg. Co., 2501 Liberty Ave., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

**GENERATING SETS**
Crocker Wheeler Electric Mfg. Co., Ampere, N. J.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

**GENERATORS (Acetylene—Portable and Stationary)**
Linde Air Products Co., The, 30 E. 42nd St., New York City.

**GENERATORS (Electric)**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Crocker Wheeler Electric Mfg. Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-10.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Udylite Co., The, 1651 E. Grand Blvd., Detroit, Mich.

**GENERATORS (Plating)**

**GRABS—for Sheets, Plates and Coils**
J. B. Engineering Sales Co., New Haven, Conn.

**GRATING**
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp., Machinery Div., Dravo Bldg., Pittsburgh, Pa.
Tri-Lok Co., Dravo Bldg., Pittsburgh, Pa.

**GREASE (Lubricating—See LUBRICANTS (Industrial)**

**GREASE RETAINERS AND SEALS**
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

**GRINDERS (Portable—Pneumatic)**
Ingersoll-Rand Co., 11 Broadway, New York City.

**GRINDERS (Surface)**
Heald Machine Co., Worcester, Mass.

**GRINDING COMPOUNDS**
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

**GRINDING MACHINES (Automotive Reconditioning)**
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

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Heald Machine Co., Worcester, Mass.

**GRINDING MACHINES (Chucking)**
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Landis Tool Company, Waynesboro, Pa.

**GRINDING MACHINES (Crank Pin, Cam, Piston, Valve Face)**
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

**GRINDING MACHINES (Oscillating)**
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

**GRINDING MACHINES (Plain and Universal)**
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

**GRINDING MACHINES (Roll)**
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Landis Tool Co., Waynesboro, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Norton Co., Worcester, Mass.

**GRINDING MACHINES (Rotary Surface)**
Heald Machine Co., Worcester, Mass.

**GRINDING MACHINES (Swing Frame)**
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

**GRINDING MACHINES (Tool and Cutter)**
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

**GRINDING WHEELS**
Carborundum Co., The, Niagara Falls, N. Y.
Macklin Co., Jackson, Mich.
Norton Co., Worcester, Mass.

**GUIDES (Mill)**
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

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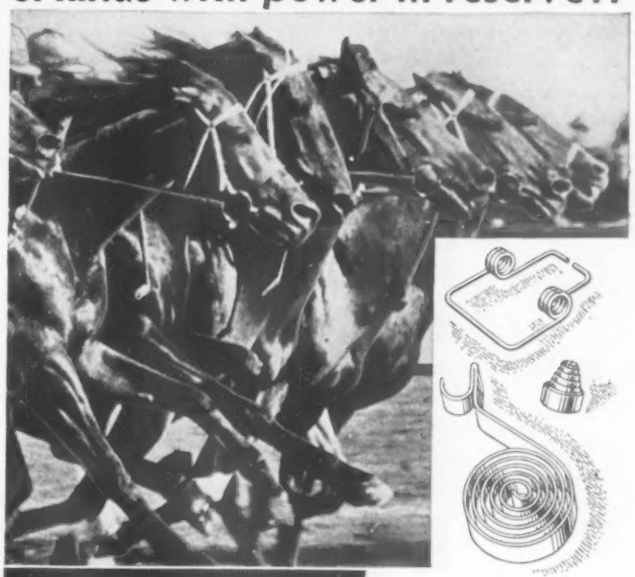



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Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

**HAMMERS (Steam)**
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Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

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Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

**HANGERS (Shaft)**
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., P. O. Box 476, Newark, N. J.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

**HARDENING—See CASE HARDENING**

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Babcock & Wilcox Co., 19 Rector St., New York City.
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.

**HEATERS (Oven)**
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.

**HEATERS (Unit)**
Dravo Corp., Machinery Div., Dravo Bldg., Pittsburgh, Pa.
Murray Iron Works, Burlington, Ia.
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.

**HITCHINGS (Mine Car)**
McKay Co., The, 1005 Liberty Ave., Pittsburgh, Pa.

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**HOISTS (Electric)**
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American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

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American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

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Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

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Ingersoll-Rand Co., 11 Broadway, New York City.

**HOOKS (Chain)**
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American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell St., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

**HOSE (Rubber)**
Goodrich, B. F., Co., The, Akron, O.
U. S. Rubber Products, Inc., 1790 Broadway, New York City.

**HYDRAULIC MACHINERY**
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
Schloemann Engineering Co., Empire Bldg., Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

**HYDRAULIC PRESSES—See PRESSES (Hydraulic)**

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Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

**INDICATORS (Blast Furnace Stock Line)**
Brosius, Edgar E., Inc., Sharpsburg, Pa.

**INGOT MOLDS**
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Co., Hubbard, O.

**INGOT PIPE ELIMINATORS**
Alpha-Lux Co., 192 Front St., New York City.

**INHIBITORS**
Alox Corporation, Buffalo Ave. and Iroquois St., Niagara Falls, N. Y.
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

**INSTRUMENTS (Electric Indicating and Recording)**
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

**INSULATING BLOCK**
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville, Inc., 22 E. 40th St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

**INSULATING BRICK**
Armstrong Cork Products Co., Lancaster, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

**INSULATING POWDER AND CEMENT**
Armstrong Cork Products Co., Lancaster, Pa.
Babcock & Wilcox Co., 19 Rector St., New York City.
Johns-Manville, Inc., 22 E. 40th St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

**INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)**
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville, Inc., 22 E. 40th St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

**IRON (Bar)**
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

**IRON (Ornamental)**
Superior Iron & Wire Works, The, 39 Pride St., Pittsburgh, Pa.

**IRON ORE**
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**JIGS AND FIXTURES**
Columbus Die, Tool & Mach. Co., The, 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

**KETTLES (Galvanizing)**
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., The, Sharon, Pa.

**KEYS (Machine)**
Moltrup Steel Products Co., Beaver Falls, Pa.

**KEYS (Woodruff)**
Moltrup Steel Products Co., Beaver Falls, Pa.

**KILNS**
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.

**KNIVES (Rotary)**
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.
Tinker, F., & Son's Co., 57th & Butler Sts., Pittsburgh, Pa.

**KNIVES (Shear, Solid Steel, Flying)**
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Tinker, F., & Son's Co., 57th & Butler Sts., Pittsburgh, Pa.

**LABORATORY WARE**
Norton Company, Worcester, Mass.
Petroleum Iron Works Co., The, Sharon, Pa.

**LAMPS (Filaments)**
Westinghouse Electric & Mfg. Co., 150 Madison Ave., New York City.

**LAMPS (Mercury Vapor)**
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

**LAMPS (Neon Glow)**
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

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Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

**LARRIES (Coal)**
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**LATHES (Roll Turning)**
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Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., W. Homestead, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**LATHES (Turret)**
Bullard Company, The, Bridgeport, Conn.

**LATHES (Turret) (Automatic Vertical)**
Bullard Company, The, Bridgeport, Conn.

**LEAD (Chemical, Corroding, Desilvered)**
St. Joseph Lead Co., 250 Park Ave., New York City.

**LEAD (Tellurium)**
National Lead Co., 111 Broadway, New York City.

**LETTERHEADS (Engraved)**
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**LEVELING MACHINES**
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McKay Machine Co., Youngstown, O.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**LIFT TRUCKS—See TRUCKS (Lift)**

**LIFTING MAGNETS—See MAGNETS (Lifting)**

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General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

**LINERS (Pump and Cylinder)**
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**LOCK WASHERS**
Shakeproof Lock Washer Co., 2501 N. Keeler Ave., Chicago, Ill.

**LOCOMOTIVE CRANES—See CRANES (Locomotive)**

**LOCOMOTIVES (Diesel-Electric)**
Cooper-Bessemer Corp., Mt. Vernon, O.

**LOCOMOTIVES (Electric)**
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General Electric Co., Schenectady, N. Y.

**LOCOMOTIVES (Gas-Electric)**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.

**LOCOMOTIVES (Oil-Electric)**
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Ingersoll-Rand Co., 11 Broadway, New York City.

**LOCOMOTIVES (Steam)**
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General Electric Co., Schenectady, N. Y.

**LOCOMOTIVES (Switching and Transfer)**
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Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Union Oil Corp., 50 W. 50th St., New York City.
Socony Vacuum Oil Co., 26 Broadway, New York City.
Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

**LUBRICATING SYSTEMS**
Farval Corp., 3270 E. 80th St., Cleveland, O.

**MACHINE WORK**
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearny, N. J.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewistown Fdry. & Mach. Co., 16 W. Elizabeth St., Lewistown, Pa.
Morgan Engineering Co., The, Alliance, O.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**MACHINERY (Shearing, Hand)**
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

**MACHINERY (Second Hand)**
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.

**MACHINERY (Special)**
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., The, Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc. Worcester, Mass.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**MAGNESIA (Electrically Fused)**
Norton Co., Worcester, Mass.

**MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)**

**MAGNETS (Lifting)**
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**MAGNETS (Separating)**
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**MANGANESE METAL AND ALLOYS**
American Manganese Steel Co., Chicago Heights, Ill.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

**MANGANESE ORE**
Amtorg Trading Corp., Sojuzugleexport Div., 261 Fifth Ave., New York City.
Samuel, Frank, Co., Inc., Harrison Bldg., Philadelphia, Pa.

**MANIPULATORS**
Alliance Machine Co., The, Alliance, O.
Morgan Engineering Co., The, Alliance, O.

**MARKERS (Industrial)**
Helmer-Staley, Inc., 2452 So. Parkway, Chicago, Ill.

**MARKING DEVICES**
Helmer-Staley Inc., 2452 So. Parkway, Chicago, Ill.

**MATTING (Safety)**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.

**METAL (Perforated)—See PERFORATED METAL**

**METAL BLAST ABRASIVES (Shot and Grit)**
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

**METAL CLEANERS**
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Udylite Co., The, 1651 E. Grand Blvd., Detroit, Mich.

**METAL SPECIALTIES AND PARTS—See STAMPINGS**

**METAL STAMPINGS—See STAMPINGS**

**METALS (Nonferrous)**
International Nickel Co., Inc., 67 Wall St., New York City.

**MICROMETERS**
Brown & Sharpe Mfg. Co., Providence, R. I.

**MILLING MACHINES**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

**MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT**

**MOLDS (Ingot)—See INGOT MOLDS**

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Vanadium Corp. of America, 420 Lexington Ave., New York City.

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International Nickel Co., Inc., 67 Wall St., New York City.

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Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-10.
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**MUCK BAR**
Bethlehem Steel Co., Bethlehem, Pa.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

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Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**NICKEL (All Commercial Forms)**
International Nickel Co., Inc., 67 Wall St., New York City.

**NICKEL (Shot)**
International Nickel Co., Inc., 67 Wall St., New York City.

**NICKEL-CHROMIUM (Shot)**
Driver-Harris Co., Harrison, N. J.

**NICKEL STEEL (Cold Drawn)**
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Co., Massillon, O.

**NOZZLES (Descaling)**
Aldrich Pump Co., The, Allentown, Pa.

**NUTS (*Also Stainless)**
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap & Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave., At W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., S. 10th and Muriel Sts., Pittsburgh, Pa.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Stove & Range Co., 2039 Fulton Rd., Cleveland, O.

**NUTS (Castellated)**
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. At W. 12th St., Erie, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

**NUTS (Cold Punched)**
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. At W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., So. 10th and Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

**NUTS (Hot Pressed)**
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave., At W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., So. 10th and Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

**NUTS (Semi-Finished)**
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. At W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., So. 10th and Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

**NUTS (Wing)**
Parker-Kalon Corp., 200 Varick St., New York City.

**OIL RETAINERS AND SEALS**
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

**OILS (Cutting)**
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Union Oil Corp., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., 26 Broadway, New York City.
Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

**OILS (Lubricating)—See LUBRICANTS (Industrial)**

**OILS (Rust Preventive)**
American Chemical Paint Co., Ambler, Pa.

**OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)**

**OVENS (Annealing, Japanning, Tempering)**
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

**OVENS (Coke, By-Product Recovery)**
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.

**OVENS (Conveyor or Truck Type)**
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.

**OVENS (Core and Mold)**
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

**OXY-ACETYLENE WELDING AND CUTTING—See WELDING**

**OXYGEN IN CYLINDERS**
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

**PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)**
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

**PACKING (Asbestos or Rubber)**
Goodrich, B. F., Co., The, Akron, O.
Johns-Manville Co., 22 E. 40th St., New York City.
U. S. Rubber Products, Inc., 1790 Broadway, New York City.

**PAINT (Alkali Resisting)**
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

**PAINT (Aluminum)**
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

**PAINT (Heat Resisting)**
American Chemical Paint Co., Ambler, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

**PAINT (Industrial)**
Quigley Company, Inc., 56 W. 45th St., New York City.

**PAINT (Marking)**
Helmer-Staley, Inc., 2452 So. Parkway, Chicago, Ill.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

**PAINT (Pretreatment)**
American Chemical Paint Co., Ambler, Pa.

**PAINT (Rust Preventive)**
American Chemical Paint Co., Ambler, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

**PAINT (Stick Form)**
Helmer-Staley, Inc., 2452 So. Parkway, Chicago, Ill.

**PERFORATED METAL**
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Filmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

**PHENOL RECOVERY PLANTS**
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.

**PICKLING COMPOUND**
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

**PICKLING EQUIPMENT**
International Nickel Co., Inc., 67 Wall St., New York City.

**PICKLING MACHINERY**
Aetna-Standard Engineering Co., The Youngstown, O.
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**PICKLING TANK LININGS**
Keagler Brick Co., 443 W. Market St., Steubenville, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

**PICKLING TANKS—See TANKS (Pickling)**

**PIG IRON**
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

**PILING (Iron and Steel)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Co., Dept. ST, Cleveland, O.

**PILING (Pressure-Treated Wood)**
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

**PILLOW BLOCKS (Ball)**
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.

**PILLOW BLOCKS (Roller Bearing)**
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Shafer Bearing Corp., 35 E. Wacker Drive., Chicago, Ill.

**PILLOW BOXES**
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

**PINIONS (Mill)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Simonds Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

**PINS (Case Hardened or Heat Treated)**
Erie Bolt & Nut Co., Liberty Ave., At W. 12th St., Erie, Pa.

**PINS (Taper)**
Moltrup Steel Products Co., Beaver Falls, Pa.

**PIPE (Brass, Bronze, Copper)**
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

**PIPE (New and Used)**
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

**PIPE (Steel)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**PIPE BENDING**
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.

**PIPE CUTTING AND THREADING MACHINERY**
Aetna-Standard Engineering Co., The, Youngstown, O.
Landis Machine Co., Waynesboro, Pa.

**PIPE ELIMINATORS**
Alpha-Lux Co., Inc., 192 Front St., New York City.

**PIPE FITTINGS**
Babcock & Wilcox Co., 19 Rector St., New York City.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machy. Corp., Harrison, N. J.

**PIPE LINES (Riveted and Welded)**
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., The, Sharon, Pa.

**PIPE MILL MACHINERY**
Aetna-Standard Engineering Co., The, Youngstown, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

**PIPE STRAIGHTENING MACHINERY**
Aetna-Standard Engineering Co., The, Youngstown, O.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

**PIPING CONTRACTORS**
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

**PISTON RINGS**
American Hammered Piston Ring Div., The Koppers Co., Baltimore, Md.

**PISTON RODS**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Burnham, Pa.
Union Drawn Steel Co., Massillon, O.

**PLANERS AND SHAPERS**
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

**PLATE CASTORS**
Hyatt Bearings Div., General Motors Corp., P. O. Box 476, Newark, N. J.

**PLATES (Sheared or Universal) (*Also Stainless)**
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
*Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**PLATES (Stainless Clad)**
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.

**Plates (Steel—Floor)—See FLOORING, (Steel)**

**PLATES (Terne and Tin)—See TIN PLATE**

**PLATING EQUIPMENT**
Udylite Co., The, 1651 E. Grand Blvd., Detroit, Mich.

**PLUGS (Expansion)**
Hubbard, M. D., Spring Co., The, 613 Central Ave., Pontiac, Mich.

**PLUGS (Rubber)**
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

**POLE LINE HARDWARE**
Oliver Iron & Steel Corp., S. 10th and Muriel Sts., Pittsburgh, Pa.

**POLES (Tubular Steel)**
National Tube Co., Frick Bldg., Pittsburgh, Pa.

**POLISHING MACHINERY (Tube and Bar)**
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.

**POLISHING MACHINES, AUTOMATIC (Stainless Steel)**
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

**POTS (Case Hardening)**
Pressed Steel Tank Co., Milwaukee, Wis.

**POTS (Melting)**
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

**PREHEATERS**
Babcock & Wilcox Co., 19 Rector St., New York City.

**PRESSED METAL PARTS**
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

**PRESSES**
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Tomkins-Johnson Co., The, Jackson, Mich.
Zeh & Hahnemann Co., Ave. "A" and Vanderpool St., Newark, N. J.

**PRESSES (Bending)**
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

**PRESSES (Forging)**
Erie Foundry Co., Erie, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

**PRESSES (Forming and Braking)**
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

**PRESSES (Hydraulic)**
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Schloemann Engineering Co., Empire Bldg., Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

**PRESSES (Punching, Drawing, Coining, Blanking, etc.)**
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.

# WHERE-TO-BUY

**PRESSES (Riveting)**
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

**PRESSES (Scrap Bundling and Baling)**
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

**PRESSES (Welding)—See WELDERS**

**PRESSURE VESSELS**
Babcock & Wilcox Co., 19 Rector St., New York City.

**PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS**

**PUG MILLS (For Blast Furnaces and Sintering Plants)**
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

**PULLEYS (Magnetic)**
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**PULVERIZERS**
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

**PUMPS**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.

**PUMPS (Boiler Feed)**
Aldrich Pump Co., The, Allentown, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

**PUMPS (Centrifugal)**
Aldrich Pump Co., The, Allentown, Pa.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Tomkins-Johnson Co., The, Jackson, Mich.
Worthington Pump & Machinery Corp., Harrison, N. J.

**PUMPS (Hydraulic)**
Aldrich Pump Co., The, Allentown, Pa.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Worthington Pump & Machinery Corp., Harrison, N. J.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.

**PUMPS (Rotary)**
Roper, Geo. D., Corp., Rockford, Ill.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.

**PUMPS (Vacuum)**
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

**PUNCHES (Multiple)**
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

**PUNCHING AND SHEARING MACHINERY**
Beatty Machine & Mfg. Co., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

**PYROMETER TUBES**
Driver-Harris Co., Harrison, N. J.
Norton Company, Worcester, Mass.

**PYROMETERS**
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

**RAIL BREAKERS**
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

**RAILS (New and Relaying)**
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

**RAILS (Steel)**
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh—Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

**REAMERS**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.

**REAMERS (Pneumatic)**
Ingersoll-Rand Co., 11 Broadway, New York City.

**REAMERS (Sand, Ingot Mold—Pneumatic)**
Ingersoll-Rand Co., 11 Broadway, New York City.

**REBUILT EQUIPMENT**
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa.

**RECEIVERS**
Petroleum Iron Works Co., The, Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.

**RECORDERS (Pressure, Speed, Temperature, Time)**
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

**REDUCERS ( Speed)—See SPEED REDUCERS**

**REDUCTION GEARS**
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.

**REFRACTORIES (Fire Clay)**
Babcock & Wilcox Co., 19 Rector St., New York City.
Eureka Fire Brick Co., 1100 B. F. Jones Law Bldg., Pittsburgh, Pa.
Keagler Brick Co., 443 W. Market St., Steubenville, O.
Quigley Company, Inc., 56 W. 45th St., New York City.

**REFRACTORIES (High Temperature)**
Alpha-Lux Co., Inc., 192 Front St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

**REFRACTORIES (Silica)**
Alpha-Lux Co., Inc., 192 Front St., New York City.

**REFRACTORIES (Silicon Carbide)**
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

**REGULATORS (Pressure)**
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

**REGULATORS (Temperature)**
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

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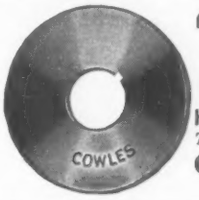


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American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

**RESISTORS (Edgewound)**
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

**RESISTORS (Graphite Disc)**
Allen-Bradley Co., 1326 So. 2nd St., Milwaukee, Wis.

**RHEOSTATS (Plating)**
Alpha-Lux Co., Inc., 192 Front St., New York City.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Udylite Co., The, 1651 E. Grand Blvd., Detroit, Mich.

**RINGS (Steel)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Burnham, Pa.
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

**RINGS (Welded Steel)**
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

**RINGS (Weldless) (*Also Stainless)**
*Midvale Co., The, Nicetown, Philadelphia, Pa.

**RIVER TRANSPORTATION**
Campbell Transportation Co., Granite Bldg., Pittsburgh, Pa.

**RIVETERS (Hydraulic—Portable and Stationary)**
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

**RIVETERS (Jam, Pedestal, Staybolt, Squeeze, Stationary, Yoke—Pneumatic)**
Ingersoll-Rand Co., 11 Broadway, New York City.

**RIVETERS (Pneumatic)**
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

**RIVETING MACHINERY**
Chambersburg Engineering Co., Chambersburg, Pa.
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., The, Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

**RIVETS (*Also Stainless)**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Oliver Iron & Steel Co., S. 10th and Muriel Sts., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, Pa.

**RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)**
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

**RODS (Drill)**
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Kidd Drawn Steel Co., Aliquippa, Pa.

**RODS (Rounds, Flats and Shapes) (*Also Stainless)**
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
*Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.,
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., Youngstown, O.

**RODS (Steel and Iron)**
Firth-Sterling Steel Co., McKeesport, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

**RODS (Welding)—See WELDING RODS**

**RODS (Wire)—See WIRE PRODUCTS**

**ROLL COOLERS (Internal, Water)**
Hunt, C. B., & Son, Salem, O.

**ROLLING DOORS AND SHUTTERS —See DOORS AND SHUTTERS**

**ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)**

**ROLLING MILL EQUIPMENT**
Aetna-Standard Engineering Co., The, Youngstown, O.
Alliance Machine Co., The, Alliance, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Cold Metal Process Co., The, Youngstown, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Schloemann Engineering Co., Empire Bldg., Pittsburgh, Pa.
Streine Tool & Mfg. Co., New Bremen, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**ROLLING MILLS (Consulting, Contracting Engineers)**
Schloemann Engineering Co., Empire Bldg., Pittsburgh, Pa.

**ROLLS (Magnetic)**
Stearns Magnetic Mfg. Co., The, 650 So. 28th St., Milwaukee, Wis.

**ROLLS (Sand and Chilled)**
Aetna-Standard Engineering Co., The, Youngstown, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Fdry. & Mach. Co., W. Federal and Reserve Sts.,

**ROLLS (Steel and Iron)**
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Fdry. & Mach. Co., W. Federal and Reserve Sts., Youngstown, O.

**ROOFING AND SIDING (Corrugated and Plain)**
American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

**ROOFING (Plastic and Liquid)**
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

**RUBBER GOODS (Mechanical)**
Goodrich, B. F., Co., The, Akron, O.
Rhoades, R. W., Metaline Co., 50 3rd St., Long Island City, N. Y.
U. S. Rubber Products, Inc., 1790 Broadway, New York City.

**RUBBER PLUGS—See PLUGS**

**RUST PREVENTIVES**
Alox Corporation, Buffalo Ave. and Iroquois St., Niagara Falls, N. Y.
Dearborn Chemical Co., McCormick Bldg., Chicago, Ill.
American Chemical Paint Co., Ambler, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

**RUST PROOFING PROCESS**
Alox Corporation, Buffalo Ave. and Iroquois St., Niagara Falls, N. Y.
American Chemical Paint Co., Ambler, Pa.

**RUST PROOFING PROCESS—Con.**
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Udylite Co., The, 1651 E. Grand Blvd., Detroit, Mich.

**SAFE ENDS (Boiler Tube)**
National Tube Co., Frick Bldg., Pittsburgh, Pa.

**SAFETY DEVICES (Electric)**
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

**SALT TABLETS**
Morton Salt Co., 208 W. Washington St., Chicago, Ill.

**SAND CONDITIONING AND PREPARING MACHINERY**
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis. Youngstown, O.

**SAWING MACHINES (Contour)**
Continental Machine Specialties, Inc., Dept. A, 1301 Washington Ave. So., Minneapolis, Minn.

**SAWS (Hot and Cold)**
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

**SAWS (Metal Cutting)**
Youngstown Sheet & Tube Co., Youngstown, O.

**SCALES**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

**SCALES (Dial)**
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co. 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

**SCALES (Monorail)**
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Kron Co., The, Bridgeport, Conn.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.

**SCALING TOOLS (Pneumatic)**
Ingersoll-Rand Co., 11 Broadway, New York City.

**SCRAP BALING PRESSES—See BALING PRESSES**

**SCREENS AND SIEVES**
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

**SCREW MACHINE PRODUCTS**
Barnes, Wallace Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
Progressive Mfg. Co., Torrington, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

**SCREW MACHINES (Automatic, Single and Multiple Spindle)**
Brown & Sharpe Mfg. Co., Providence, R. I.

**SCREW STOCK—See STEEL (Screw Stock)**

**SCREWS**
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Progressive Mfg. Co., Torrington, Conn.

**SCREWS (Cap, Set, Safety-Set)**
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.

**SCREWS (Cold Headed)**
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.

**SCREWS (Conveyor)**
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

**SCREWS (Drive)**
Parker-Kalon Corp., 200 Varick St., New York City.

**SCREWS (Hardened Self-Tapping)**
Parker-Kalon Corp., 200 Varick St., New York City.

**SCREWS (Machine)**
Progressive Mfg. Co., Torrington, Conn.

**SCREWS (Socket—Cold Forged)**
Parker-Kalon Corp., 200 Varick St., New York City.

**SCREWS (Thumb)**
Parker-Kalon Corp., 200 Varick St., New York City.

**SCRUBBERS (Steel)**
Youngstown Foundry & Machine Co., W. Federal & Reserve Sts., Youngstown, O.

**SEAMLESS STEEL TUBING—See TUBES**

**SEPARATORS (Magnetic)**
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**SEPARATORS (Sand)**
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

**SHAFT HANGERS—See HANGERS (Shaft)**

**SHAFTING**
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Co., Burnham, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

**SHAPERS**
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

**SHAPES (Brass, Bronze, Nickel Silver)**
Titan Metal Mfg. Co., Bellefonte, Pa.

**SHAPES (Steel)—See STEEL (Structural)**

**SHAPES, SPECIAL (Steel)**
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

**SHEAR BLADES**
American Shear Knife Co., 3rd and Ann Sts., Homestead Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.

**SHEARS**
Aetna-Standard Engineering Co., The, Youngstown, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Hyde Park Fdry. & Mach. Co. Hyde Park, Pa.
Lewis Fdry. & Mach. Co. P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Foundry & Mach. Co., W. Federal and Reserve Sts., Youngstown, O.

**SHEARS (Metal Band)**
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

**SHEET BARS**
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

**SHEET CARRIERS**
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J. B. Engineering Sales Co., New Haven, Conn.

**SHEET METAL PRODUCTS—See STAMPINGS**
Streine Tool & Mfg. Co., New Bremen, O.

**SHEET METAL WORKERS MACHINES**
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.

**SHEET STEEL ASSEMBLIES (Fabricated)**
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Pk. Ave., Philadelphia, Pa.

**SHEET STEEL PILING (New and Used)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

**SHEETS (Acid Resisting)**
International Nickel Co., Inc., 67 Wall St., New York City.

**SHEETS (Black)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

**SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)**
American Brass Co., The, 25 Broadway, New York City.
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

**SHEETS (Corrugated)**
American Rolling Mill Co., The, Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

**SHEETS (Deep Drawing and Stamping)**
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

**SHEETS (Electrical)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

**SHEETS (Galvanized)**
American Rolling Mill Co., The, Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

**SHEETS (Hot Rolled and Hot Rolled Annealed)**
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

**SHEETS (Long Terne)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

**SHEETS (Perforated)**
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

**SHEETS (Reinforced)**
Erdle Perforating Co., 171 York St., Rochester, N. Y.

**SHEETS (Roofing)—See ROOFING AND SIDING**

**SHEETS (Stainless)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

**SHEETS (Stainless Clad)**
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.

**SHEETS (Tin)—See TIN PLATE**

**SHEETS (Tin Mill Black)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

**SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Newport Rolling Mill Co., The, Newport, Ky.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

**SIEVES—See SCREENS AND SIEVES**

**SILICO-MANGANESE**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

**SILICON METAL AND ALLOYS**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

**SKELP (Steel)**
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

**SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)**
Brosius, Edgar E., Inc., Sharpsburg, Pa.

**SMALL TOOLS**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.

**SOAKING PITS**
Amsler-Morton Co., Fulton Bldg., Pittsburgh, Pa.
Criswell, James, Co., Keenan Bldg., Pittsburgh Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

**SOLVENT (Degreasing)**
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

**SPACING TABLES**
Thomas Machine Mfg. Co., Pittsburgh, Pa.

**SPECIAL MACHINERY—See MACHINERY (Special)**

**SPEED REDUCERS**
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Grant Gear Works, 2nd and B Sts., So. Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

**SPIEGELEISEN**
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

**SPIKE MACHINES**
Youngstown Foundry & Mach. Co., W. Federal and Reserve Sts., Youngstown, O.

**SPIKES (Screw)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

**SPLICE BARS (Rail)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

**SPRINGS**
**(*Also Stainless)**
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Standard Steel Works Co., Burnham, Pa.
Washburn Wire Co., Inc., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

**SPROCKETS**
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

**SPRUE CUTTERS**
Shuster, F. B., Co., The, New Haven, Conn.

**STACKS (Steel)—See BRIDGES, ETC.**

**STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.**

**STAMPINGS**
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Pk. Ave., Philadelphia, Pa.
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Erdie Perforating Co., 171 York St., Rochester, N. Y.
Grammes, L. F., & Sons, Inc., Allentown, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Pressed Steel Tank Co., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Toledo Stamping & Mfg. Co., 99 Fearing Blvd., Toledo, O.
Transue & Williams Steel Forging Co., Alliance, O.
Whitehead Stamping Co., 1661 W. Lafayette Blvd., Detroit, Mich.

**STAPLES (Wire)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

**STARTERS (Electric Motor)**
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

**STEEL (Alloy)**
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Washburn Wire Co., Phillipsdale, R. I.

**STEEL (Alloy, Cold Finished)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

**STEEL (Clad—Corrosion Resisting) (*Also Stainless)**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
*Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div. Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.
Superior Steel Corp., Carnegie, Pa.

**STEEL (Cold Drawn)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

**STEEL (Cold Finished)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

**STEEL (Cold Rolled Strips Electro-Galvanized)**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.

**STEEL (Color Lacquered)**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.

**STEEL (Corrosion Resisting)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.
American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th Street, Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Ingersoll Steel & Disc Div. Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Steel & Tube Co., Canton, O.

**STEEL (Die)**
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Milne, A., & Co., 745 Washington St., New York City.
Vanadium-Alloys Steel Co., Latrobe, Pa.

**STEEL (Drill)**
Milne, A., & Co., 745 Washington St., New York City.

**STEEL (Electric)**
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Steel & Tube Co., Canton, O.

**STEEL (High Speed)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Div. Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.
Milne, A., & Co., 745 Washington St., New York City.
Vanadium-Alloys Steel Co., Latrobe, Pa.

**STEEL (High Tensile, Low Alloy)**
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**STEEL (Manganese)**
American Manganese Steel Co., Chicago Heights, Ill.

**STEEL (Nitriding)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

**STEEL (Rustless)—See STEEL (Corrosion Resisting)**

**STEEL (Screw Stock)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

# WHERE-TO-BUY

**STEEL (Spring)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Washburn Wire Co., Phillipsdale, R. I.

**STEEL (Stainless)—See STEEL (Corrosion Resisting)**

**STEEL (Strip, Copper Coated)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., Warren, O.

**STEEL (Strip, Hot and Cold Rolled)**
**(*Also Stainless)**
*Acme Steel Co., 2826 Archer Ave., Chicago, Ill.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cold Metal Process Co., The, Youngstown, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Thomas Steel Co., Warren, O.
Washburn Wire Co., Phillipsdale, R. I.
Weirton Steel Co., Weirton, W. Va.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

**STEEL (Strip, Tin Coated)**
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., The, Warren, O.

**STEEL (Strip, Zinc Coated)**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., Warren, O.

**STEEL (Structural)**
**(*Also Stainless)**
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co. Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co, 38 S. Dearborn St., Chicago, Ill.
*Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Levinson Steel Co., The, 39 Pride St., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**STEEL (Tool)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., 900 E. 67th St., Cleveland, O.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Darwin & Milner, Inc., 260 W. 4th St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Div., Borg-Warner Corp., 310 So. Michigan Ave., Chicago, Ill.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Kidd Drawn Steel Co., Aliquippa, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale, Co., The, Nicetown, Philadelphia, Pa.
Milne, A., & Co., 745 Washington St., New York City.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Vanadium-Alloys Steel Co., Latrobe, Pa.

**STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.**

**STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.**

**STEEL PLATE CONSTRUCTION**
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Federal Shipbuilding & Dry Dock Co., Kearny, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Petroleum Iron Works Co., The, Sharon, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

**STEEL STRAPPING (Skid Shipping)**
Acme Steel Co., 2826 Archer Ave., Chicago, Ill.

**STELLITE**
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

**STOKERS**
Babcock & Wilcox Co., 19 Rector St., New York City.

**STOPPERS (Cinder Notch)**
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

**STORAGE BATTERIES—See BATTERIES (Storage)**

**STRAIGHTENING MACHINERY**
Aetna-Standard Engineering Co., The, Youngstown, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Youngstown Foundry & Mach. Co., W. Federal and Reserve Sts., Youngstown, O.

**STUDS (Alloy, Carbon or Stainless)**
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.

**SULPHURIC ACID**
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Pittsburgh, Pa.


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**SYNTHETICS—See LACQUERS AND SYNTHETICS**

**TACHOMETERS**
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

**TANK LININGS**
Quigley Company, Inc., 56 W. 45th St., New York City.

**TANKS (Pickling)**
Goodrich, B. F., Co., Akron, O.
U. S. Rubber Products, Inc., 1790 Broadway, New York City.

**TANKS (Storage, Pressure, Riveted, Welded)**
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., The, Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

**TANKS—WOOD OR STEEL (Rubber or Lead Lined)**
Goodrich, B. F., Co., Akron, O.
U. S. Rubber Products Inc., 1790 Broadway, New York City.

**TANTALUM CARBIDE**
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit, Mich.

**TAPS AND DIES**
Landis Machine Co., Waynesboro, Pa.

**TEMPERING**
Holden, A. F., Co., New Haven, Conn.

**TERNE PLATE—See TIN PLATE**

**TESTING MACHINES (Moisture Tester)**
Alpha-Lux Co., Inc., 192 Front St., New York City.

**THERMOMETERS**
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

**THREAD CUTTING TOOLS**
Landis Machine Co., Waynesboro, Pa.

**TIE PLATES**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

**TIN PLATE**
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept ST, Cleveland, O.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**TIN PLATE MACHINERY**
Aetna-Standard Engineering Co., The, Youngstown, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.
Youngstown Foundry & Mach. Co., W. Federal and Reserve Sts., Youngstown, O.

**TITANIUM**
Vanadium Corp. of America, 420 Lexington Ave., New York City.

**TONGS (Rail Handling)**
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.

**TOOL BITS (High Speed)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

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Ingersoll-Rand Co., 11 Broadway, New York City.

**TOOLS (Precision, Lathe, Metal Cutting, etc.)**
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit, Mich.

**TOOLS (Tantalum Carbide)**
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit, Mich.

**TOOLS AND PLUGS (Roll Turners)**
Tinker, F., & Son's Co., 57th & Butler Sts., Pittsburgh, Pa.

**TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)**
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

**TORCHES AND BURNERS (Air—Gas)**
American Gas Furnace Co., Elizabeth, N. J.

**TOWERS (Transmission)**
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

**TRACK ACCESSORIES**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

**TRACK BOLTS**
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**TRAILERS (Arch-Girder)**
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

**TRAMRAILS**
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

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**TRANSMISSIONS (Variable Speed)**
Reeves Pulley Co., Columbus, Ind.

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**TRAYS (Heat Treating)**
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.

**TREADS (Safety)**
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Co., Pittsburgh-Chicago.
Dravo Corp., Machinery Dept., Dravo Bldg., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Dravo Bldg., Pittsburgh, Pa.

**TROLLEYS**
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

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Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Automatic Transportation Co., 101 W. 87th St., Chicago, Ill.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
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**TRUCKS (Lift)**
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Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
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Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.

**TUBE MILL MACHINERY**
Aetna-Standard Engineering Co., The, Youngstown, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Youngstown Foundry & Machine Co., W. Federal and Reserve Sts., Youngstown, O.

**TUBES (Boiler)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 15020 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

**TUBES (Brass, Bronze, Copper)**
Bridgeport Brass Co., Bridgeport, Conn.

**TUBING (Alloy Steel) (*Also Stainless)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Timken Steel & Tube Co., Canton, O.

**TUBING (Cold Drawn Seamless Steel)**
Columbia Steel Co., San Francisco, Calif.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 15020 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.

**TUBING (Copper, Brass, Aluminum)**
Shenango-Penn Mold Co., Dover, O.

**TUBING (Welded Steel)**
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Tube Co., The, 15020 Woodward Ave., Detroit, Mich.
Youngstown Sheet & Tube Co., The, Youngstown, O.

**TUMBLING BARRELS (Coke Testing)**
Brosius, Edgar E., Inc., Sharpsburg, Pa.

**TUNGSTEN CARBIDE**
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Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

**TUNGSTEN CARBIDE (Tools and Dies)**
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Carboloy Co., Inc., 2985 Jefferson Ave., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.

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Vanadium Corp. of America, 420 Lexington Ave., New York City.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.
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Murray Iron Works Co., Burlington, Iowa.
Smith, S. Morgan, Co., York, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

**TURBO BLOWERS—See BLOWERS**

**TURBO-GENERATORS**
Murray Iron Works, Burlington, Iowa.

**TURNTABLES**
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The 1140 Ivanhoe Rd., Cleveland, O.

**TURRET LATHES—See LATHES (Turret)**

**TUYERES**
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**TWIST DRILLS**
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**VALVES (Blast Furnace)**
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Brosius, Edgar E., Inc., Sharpsburg, Pa.

**VALVES (Butterfly)**
Smith, S. Morgan, Co., York, Pa.

**VALVES (Control—Air and Hydraulic)**
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

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Crane Co., The 836 So. Michigan Blvd., Chicago, Ill.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

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Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

**VALVES (Hydraulic De-Scaling)**
Hunt, C. B., & Son, Salem, O.

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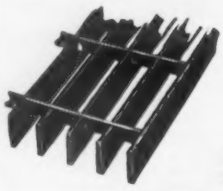

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150-ampere G-E alternating-current arc welder

150-ampere G-E direct-current arc welder

# For Low-current Work

## NEW A-C UNIT, 150-Ampere Size

Here's the answer to those who have been asking for a reasonably priced alternating-current arc welder of this size from which safe, dependable service can be obtained day in and day out.

For instance, it has woven, spun-glass insulation throughout, and all internal connections are solidly brazed to stand up under the heat of heavy loads.

Choice of two open-circuit voltages is provided so that all types of a-c electrodes can be used. Incidentally, the new G-E electrode, Type W-25, is among the best a-c electrodes available.

Continuous, stepless control of welding current is provided over the entire range of 30 to 180 amperes.

Totally enclosed in a strong, cylindrical, sheet-steel case, the entire unit meets the requirements of the latest standards of the Underwriters' Laboratories, Inc., and has been tested and listed under its Re-examination Service.

## NEW D-C SET, 150-Ampere Size

"A man has got to actually try that set to believe it could be possible," is the way one operator described the satisfaction he obtained by using this new G-E welder.

And there is real justification for such enthusiasm because this new small set provides the same outstanding performance with bare, lightly coated, or heavily coated electrodes which has always distinguished General Electric d-c single-operator arc welders in the larger sizes—in fact, it is a small copy of the same fundamental split-pole-generator design.

Excellent mechanical stability has been obtained by a compact horizontal design—the unit occupies less than 2½ square feet of floor space. The rotor is dynamically balanced for smooth operation. Both ball bearings are horizontally mounted and sealed to assure proper, clean lubrication for long periods without attention.

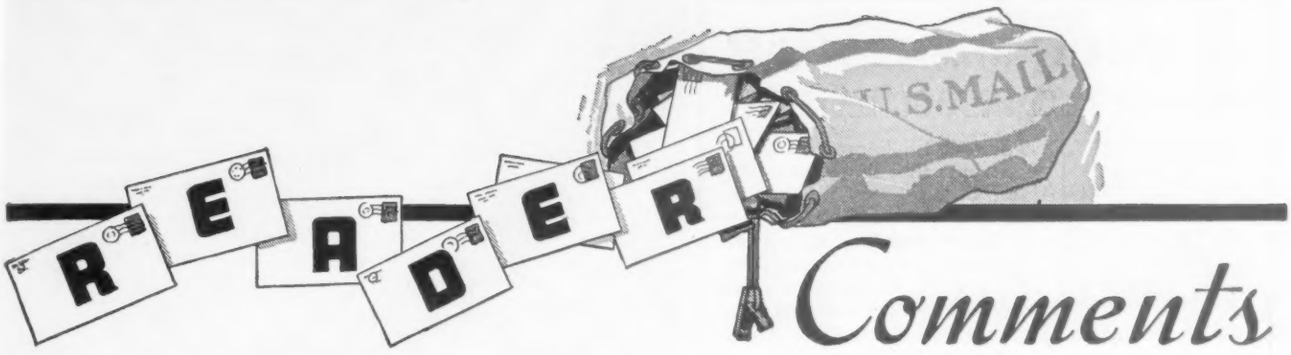
Isothermic overload protection permits maximum safe overloads to be carried without harm and without unnecessary interruptions. There are many other money-making features, too.

*But the easiest way to appreciate the outstanding dollar value you can obtain by purchasing either of these new arc welders is to try them. Call or write the nearest G-E arc-welding distributor or G-E sales office today for a trial, or for further information regarding these new units or any equipment for modern arc welding. General Electric Company, Schenectady, N. Y.*

**Visit the G-E exhibit at the National Metal Exposition, Detroit, October 17-21, Booths A-109, A-115**

**GENERAL ELECTRIC**

140-85




# Comments

***Readers are invited to comment upon articles, editorials, reports, prices or other editorial material appearing in STEEL. The editors cannot publish unsigned communications, but at their discretion may permit a writer to use a pseudonym when a bona fide reason exists for withholding his identity. Letters should be brief—preferably not exceeding 250 words.***

## Salesman Asks Fair Play

*To the Editor:*

It is high time something was said about those executives who take particular delight in keeping day-to-day callers cooling their heels in reception rooms, regardless of how legitimate the business of these callers may be.

Fortunately in recent years, purchasing departments have come to recognize that "peddlers" at least deserve a prompt hearing, and have cut through the red tape leading to their doors. But there are still too many presidents, vice presidents and others who, when informed that someone wishes to see them, promptly forget about the visitor and he is left to contemplate the beauties of ashtrays and month-old magazines reposing on tables in reception rooms.

As one person who is making a legitimate and determined effort to make a living, which involves contacting industrial executives, I would like to beseech their attention in this matter. If a man is too busy to see a caller, let him so inform the reception clerk, and the caller can proceed somewhere else.

This mysterious business of giving your name, address, company connection, whom you wish to see, why you wish to see him, etc., and then reclining in a chair while myriads of buttons are pushed, blank-faced flunkeys flit in and out of doors and buzzers resound through distant halls, should end in the interest of efficiency and good feeling.

The time of so-called peddlers is perhaps just as valuable if not more so than the time of your average executive. If he is not available, why not so inform those who would like to see him? If three others are waiting to see the gentleman, why not tell the fourth man in line? Is there any profound secret involved, the disclosing of which might cause the wheels of industry to fly apart?

I know that reception rooms of industry are packed with others who will echo these sentiments. Let's come out in the open with this business.

SALES ENGINEER

*Detroit*

## Punitive Taxes a Menace

*To the Editor:*

"Nor shall private property be taken for public use without just compensation." — Art. V, Amendments.

This text was not chosen to serve as a basis for a discourse on the Mexican situation, although our department of state is considerably exercised over it and justly so.

We have a condition at home that goes much farther. It is largely the cause of our present depression and presents a far more serious problem.

In order to meet its necessary expenses and to insure its own existence, every government possesses the power to tax. The framers of the constitution were careful to limit this power, well knowing that in the past its abuse by governmental authorities brought about national collapse.

The passage of the XVI amendment removed the barrier and the way was open for continually heavier taxation. In some cases the taxes laid today are frankly made punitive in order to "divide the wealth."

After a corporation has paid the various federal taxes on its income and the balance is passed on to the stockholder and he in turn has paid his individual normal and surtax, if a large owner, he retains something like 10 per cent out of the original amount.

If the money has been dishonestly made the taxpayer should have none of it unless it is the government's desire to encourage him in his dishonesty and thus share in the loot. If honestly made then there is no basis in ethics, common decency or horse sense for robbing him of 90 per cent of what is his.

It may be argued that the income tax is not levied against the taxpayer's property, but against its increment. However, let any kind of property be deprived of its power to produce income or its possibility of enhancement and what becomes of its capital value?

Is it not about time to consider all this in the light of the fifth amendment?

J. H. HERTNER

*President, Hertner Electric Co., Cleveland*

## Women to Blame?

*To the Editor:*

The subject of considerable conversation today is unemployment and high taxes. The time for action—instead of mere talk—has arrived, and some of our beliefs should be put into actual practice.

Prior to the World war we did not have much female labor in our factories. The war has been over for about 20 years and still women who took jobs during that period have continued until the present time.

The point I am coming to is this: Do you realize that in Chicago and its suburbs there are about 5,000,000 inhabitants? Do you likewise realize that this represents about 1,250,000 families? Do you realize that about 40 per cent of wives today are holding a job or position in some store, office or factory? Do you realize that if these women would give up their jobs and stay at home a minimum of 500,000 jobs would be created? Do you realize what this would mean to Chicago alone, and if carried out nationally

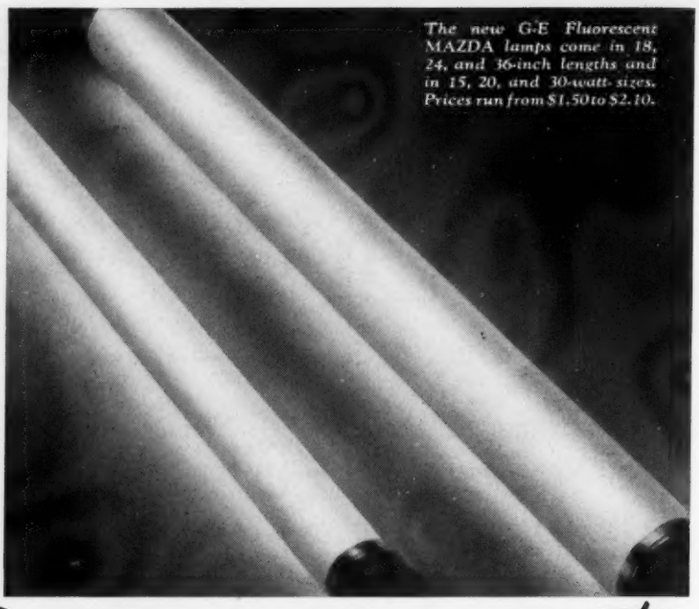
(*Please turn to Page* 94)

## G-E FLUORESCENT MAZDA LAMPS PROVIDE NEW INDOOR DAYLIGHT

The new G-E Fluorescent MAZDA lamps offer shops, factories, and industrial plants almost unlimited possibilities wherever daylight effects or colored light sources are wanted. They give several times more light for the current consumed than filament lamps of the same wattage and color. For the same amount of light, they are 50% cooler.

The daylight Fluorescent lamp offers the closest approach to real daylight ever produced at high efficiency. It will be particularly useful for industries where color discrimination is important.

These new lamps (also available in red, gold, pink, blue, green, and white) require special sockets and control equipment which is now available.



*The new G-E Fluorescent MAZDA lamps come in 18, 24, and 36-inch lengths and in 15, 20, and 30-watt sizes. Prices run from $1.50 to $2.10.*

# GENERAL ELECTRIC *presents*

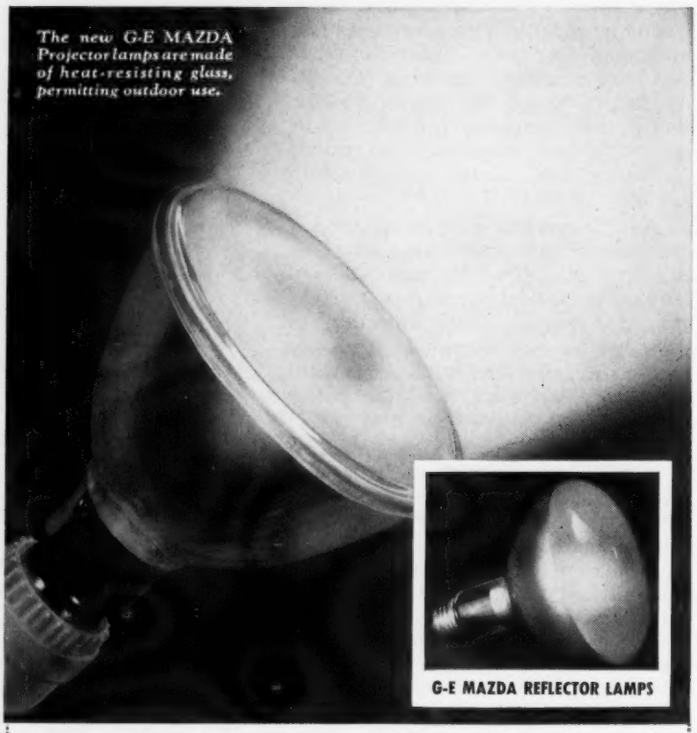
# 2 REVOLUTIONARY NEW MAZDA LAMPS

## G-E MAZDA PROJECTOR LAMPS ARE COMPLETE LIGHTING UNITS

Here is another new type of lamp never before available! The G-E MAZDA Projector lamp that combines a mirror reflector, a light-directing lens, and a 150-watt lamp filament in one hermetically sealed-in unit, protected from dust, moisture, and deterioration. Available in two types—Spotlight type which has a concentrating lens and produces a narrow light beam of high intensity, and the Floodlight type with a lens that spreads the beam to illuminate a larger area. Both types list at $1.70.

• • •

General Electric also presents the 150-watt MAZDA Reflector lamp (see inset photo at lower right). With the same type of mirrored surface used on the Projector lamps, the Reflector lamp is made of ordinary glass, and will be of value wherever a smaller, lightweight lamp with a beam of less intensity is needed. Its use is also recommended where lower first cost is important. Price $1.10.



*The new G-E MAZDA Projector lamps are made of heat-resisting glass, permitting outdoor use.*

G-E MAZDA REFLECTOR LAMPS

**MAIL THIS COUPON FOR COMPLETE INFORMATION**

General Electric Co., Dept. 166-S, Nela Park, Cleveland, O.
Please send me complete information on:
A) G-E Fluorescent MAZDA lamps. ☐
B) G-E MAZDA Projector and Reflector lamps. ☐

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